Monetary Policy and International Capital Flows: The Recent Experience

by

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Born on April, 16, 1991, in Lisbon, the student started his education in São João da Madeira where he completed the High School. Then, in September, 2009, he moved to Porto to study Economics at Faculdade de Economia do Porto, faculty from which he graduated in 2013.

Following his interesting in macroeconomics and monetary economics, he started his Master's Degree in Economics in the same institution in 2013. In the third quarter of 2014 he started to work at PricewaterhouseCoopers & Associados as assurance associate.

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Abstract: This work investigates the main determinants of capital flows to advanced and non-advanced economies in the last decade and assesses whether and how unconventional monetary policies played a role as an additional determinant in explaining capital flows in this recent experience. We contribute to the literature by using an alternative measure of capital flows that allow us to distinguish the investment from the disinvestment component of the balance of payments. Our main findings are: first, the determinants of capital flows in the pre-crisis period were also significant in explaining the capital flows in the post-crisis period, both for advanced and non-advanced economies. Second, unconventional monetary policies are one additional determinant of capital inflows to advanced and non-advanced economies. Finally, we find that unconventional monetary policies pushed capital flows to non-advanced economies in form of new investment from foreign agents and pulled away capital inflows in form repatriation of capital.

Resumo: O objeto de estudo deste trabalho foca-se nos determinantes dos fluxos de capitais para economias avançadas e não avançadas durante a última década e de que forma é que as políticas monetárias não convencionais contribuíram como fator explicativo adicional. A nossa contribuição para a literatura que nos é próxima está relacionada com a utilização de uma medida alternativa dos fluxos de capitais que permitem distinguir a componente de investimento e de desinvestimento da balança de pagamentos. Os nossos resultados são: primeiro, os determinantes dos fluxos de capitais para economias avançadas e não avançadas do período pré-crise mantiveram-se significativos no período pós-crise. Em segundo lugar, os resultados suportam a hipótese de que as políticas monetárias não convencionais agiram como um determinante adicional dos fluxos de capital para as economias avançadas e não-avançadas. Por último, os resultados permitem-nos concluir que as políticas monetárias não convencionais surtiram efeito nos fluxos de capital para economias não-avançadas através do aumento das decisões de investimento para essas economias ao mesmo tempo que contribuíram para a diminuição da repatriação de capital por parte dos agentes domésticos.

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1. Introduction

The global financial crisis (GFC) triggered unusual actions from the major central banks as interest rates were successively cut and reached the zero-lower bound. In order to boost weak asset markets and stimulate real economic activity, the G4[1] central banks initiated unconventional monetary policies (UMP), which culminated in an outstanding expansion of their balance sheets (Fawley & Neely, 2013). The impacts of such UMP measures have become increasingly controversial.

Advanced economies (AE) argue that unusual expansionary monetary policy stabilized financial markets and promoted growth; therefore, its global effects must be regarded as positive. Even if necessary under certain conditions to boost high-income countries, low interest rates during prolonged periods of time may threaten financial stability as low risk-free yields could induce a change in the asset allocation of investors to non-advanced economies (NAE)[2] rather than AE (IMF, 2010a and IMF, 2011b). Moreover, NAEs' policy makers made their suspicion about these policies' negative spillovers very clear. When put together with domestic factors, such as growth prospects or appreciated currencies, the UMP was feared to create an environment that could would affect capital flows, exchange rates, asset prices (Cho & Rhee, 2013), generating a decrease in the robustness of their financial systems (Chen, Mancini-Griffoni, & Sahay, 2014), leading to the expansion of domestic liquidity and potential set off credit bubbles, a build-up of imbalances, including the drive up of asset prices to unsustainable levels and overheating of the economies, and possible external shocks in the form of sudden stops (IMF, 2010a, IMF, 2011b and Powell, 2010).[3]

There is literature that already assessed similar questions: Fratzscher, Lo Duca, & Straub (2013), Ahmed & Zlate (2014), and Burns *et al.* (2014) concluded for a positive effect of UMP on capital inflows both to AE and NAE beyond the global and domestic

[1] We will follow the work of Cerutti, Claessens & Ratnovski (2014), Nier, Sedik, & Mondino (2014) and Burns, Kida, Lim, Mohapatra, & Stocker (2014) and consider United States, Euro Area, United Kingdom, and Japan as the G4 economies.

[2] Non-advanced economies refers to emerging and developing countries.

[3] The mechanisms by which capital inflows affect variables as asset prices (see e.g. Kim & Yang , 2011, and Taguchi, Sahoo, & Natara, 2015), house price (see e.g. Tillmann, 2013, Aizenman & Jinjarak, 2009, and Jinjarak & Sheffrin, 2011), and credit growth (see e.g. Lane & McQuade, 2013, and Arslan & Taskin, 2014) is object of an extensive literature.

conditions, even though these works employed different measures of UMP. The contribution of our work to this literature is on the use of the four-way decomposition, an alternative measure of capital inflows proposed by Janus & Riera-Crichton (2013). This measure intends to distinguish the investment and disinvestment components of the balance of payments. By doing so, it could help to correctly classify disinvestments as outflows rather than negative inflows and consequently help policymakers design and monitor effective capital controls (Janus & Riera-Crichton, 2013). Additionally, this decomposition increases the ability to predict financial crises comparing with the study of financial crises through net and gross capital flows (Janus & Riera-Crichton, 2013) as well as is helpful to understand which components affect output growth the most during financial crises (Janus & Riera-Crichton, 2014).

This work aims to answer the following three questions (i) Which factors influenced capital to flow to economies during the last decade? (ii) Did the determinants that explain the capital flows in the pre-crisis period also explain the capital flows in the post-crisis period? (iii) To which extent are unusual monetary policies influencing capital flows?

Revealing some results, our study allowed us to conclude that for NAE the determinants of net inflows are similar to the determinants of gross inflows. Additionally, our results support the idea that the recent experience of AE and NAE was different. However, proceeding with an estimation of the model including the two groups does not allow the model to capture both experiences in the most adequate way. In addition, we found empirical support for the hypothesis that UMP pushed capital to flow to NAE, with capital flowing to those economies through the increase of investment decisions of foreign agents. However, the four-way decomposition produces results that allow us to conclude that UMP pulled capital inflows in form of capital repatriation from national agents.

The rest of our work is organized in the following way: chapter 2 presents a succinct exposition of capital flow's recent experience; chapter 3 presents the literature review regarding monetary policy and the determinants of capital flows; chapter 4 will deal with the definition of the econometric model and other methodological considerations;

on chapter 5 we will present the results, discuss them, and briefly point to some robustness exercises we have done; chapter 6 concludes the work.

2. Recent experience on capital flows

Based on what captured the attention of policymakers and on the focus institutions that support policymakers' decisions, we will follow IMF (2011a), and compute and analyze the capital inflows for the most representative economies of Asia, Latin America, Emerging Europe, Middle East, and Africa (EMEA) as well as gross capital outflows for AE.

Regarding NAE, this option tends to be close to Ahmed & Zlate (2014) who selected the largest capital inflows recipients in Latin America and Asia for their sample, excluding world financial centers as Hong Kong and Singapore. The main difference is related with the inclusion of EMEA's countries: Ahmed & Zlate (2014) argue their focus on concerns such as real exchange rate appreciation pressures, and spillover effects of AE' expansionary policies do not apply to emerging Europe economies. However, this region captured attention in the literature regarding the potential vulnerabilities due to the type of flows that flooded the region – mainly bank and portfolio flows – which are more prone to raise a scenario in which investors quickly reverse them (IMF, 2011b). Therefore, taking into account the latter argument we will proceed to include EMEA economies.

In a different way, IMF (2014e) focus on the top eight receivers[4] of net capital flows which account for almost 90% of capital inflows (or 75% of gross capital inflows) to emerging economies in the 2010Q1 – 2012Q4 period. From these emerging economies, we do not include China due to data restrictions. The remaining economies are part of our sample. [5]

Figure 1[6] presents the gross capital inflows for the selected NAE during the period 2005Q1-2014Q4. One can see four different phases: i) a sharp reduction in the last quarter of 2008; ii) a recovery stage during the beginning of 2009; iii) a reduction in the

[4] Brazil, China, India, Indonesia, Mexico, Peru, Poland, and Turkey.

[5] Brazil, Chile, Colombia, Hungary, India, Indonesia, Israel, Korea, Malaysia, Mexico, Peru, Phillipines, Poland, Romania, Russian Federation, South Africa, Thailand and Turkey.

[6] Figures 1 to 2 and A1 to A3 represent the gross capital inflows to non-advanced economies and gross outflows from the advanced economies in % of the GDP, which are calculated with data extracted from table A1.

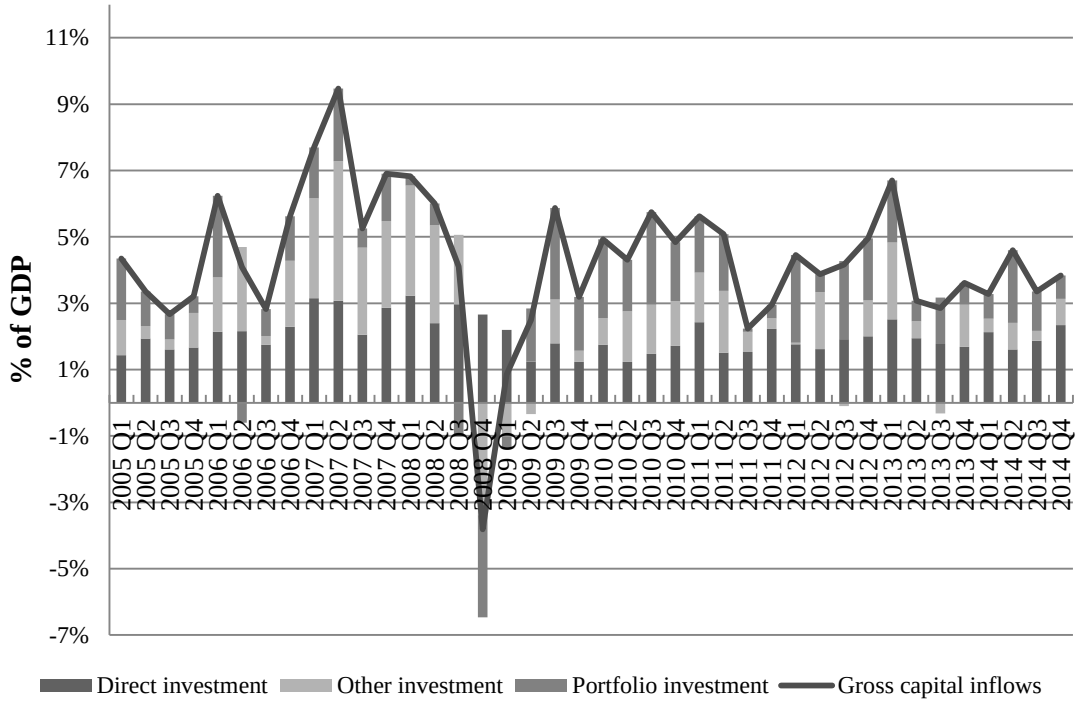
last two quarters of 2011; and finally iv) a substantial decline during the first two quarters of 2013.

Following the global financial crisis in the third quarter of 2008 tight financial conditions around the world triggered an increase in risk aversion around the globe leading to a retrenchment in private capital flows and a repatriation of funds to mature markets (ECB, 2009). This effect was amplified by the decrease of growth prospects in NAEs given the transmission, through the financial and trade channels, of the economic performance of U.S. economy as well as European and advanced Asian (IMF, 2009a). In conclusion, a sharp reduction of capital inflows to emerging and developing economies prevailed in the last quarter of 2008 and the first quarter of 2009 (figure A1 to A3 in annex) reflecting market concerns regarding both internal and external macroeconomic vulnerabilities of NAE, namely currency mismatches, weak risk management and fast credit growth (IMF, 2009a & IMF, 2009b). This decrease was driven mainly by both portfolio and other inflows and affected emerging Asian economies more severely and Latin American and EMEA economies in a lower degree. In all the referred cases, portfolio and bank flows drove the behavior of capital flows, reflecting favorable conditions for carry-trade activity such as better economic prospects (ECB, 2010b). On the contrary, foreign direct investment inflows remained stable during the turmoil.

After the sharp decrease in the last quarter of 2008, the subsequent period registered a recovery of capital inflows to NAE as a consequence of the improvement in these economies prospects', the reduction in interest rates in AE and the increase in investors' risk appetite (IMF, 2010b). These factors were feared to create a harmful environment which would drive capital flows to emerging and developing economies and could lead to asset price bubbles, asset price appreciation, and surges in inflows when external conditions are tightened (IMF, 2010b, IMF, 2010c). Beyond the possible damage these flows could inflict to those economies, persistent private inflows could also have strong potential consequences on global financial markets (ECB, 2011). In the last quarter of 2009, gross capital flows to Latin America, Emerging Asia, and EMEA accounted for almost the double of the values of the retrenchment episode and close to the values

registered during the period from 2005 to 2008. The investor's portfolio reallocation into NAE was driven by portfolio and other flows principally on Asia and Latin America. This reallocation occurred while growth and yield differentials remained large enough to influence investor's decisions (IMF, 2011b).

Figure 1 - Capital inflows to non-advanced economies



International spillovers from the Eurozone crisis regarding the concerns related with the interaction between sovereign and financial sector risks (ECB, 2011) affected the behavior of capital flows to NAE during the last two quarters of 2011 (Ahmed & Zlate, 2014). Asia and EMEA economies were the ones where greater reductions of capital flows were registered, namely related with bank flows and latterly portfolio flows. Latin American economies registered a smoother reduction, which was a consequence of a sudden stop of portfolio flows for this region.

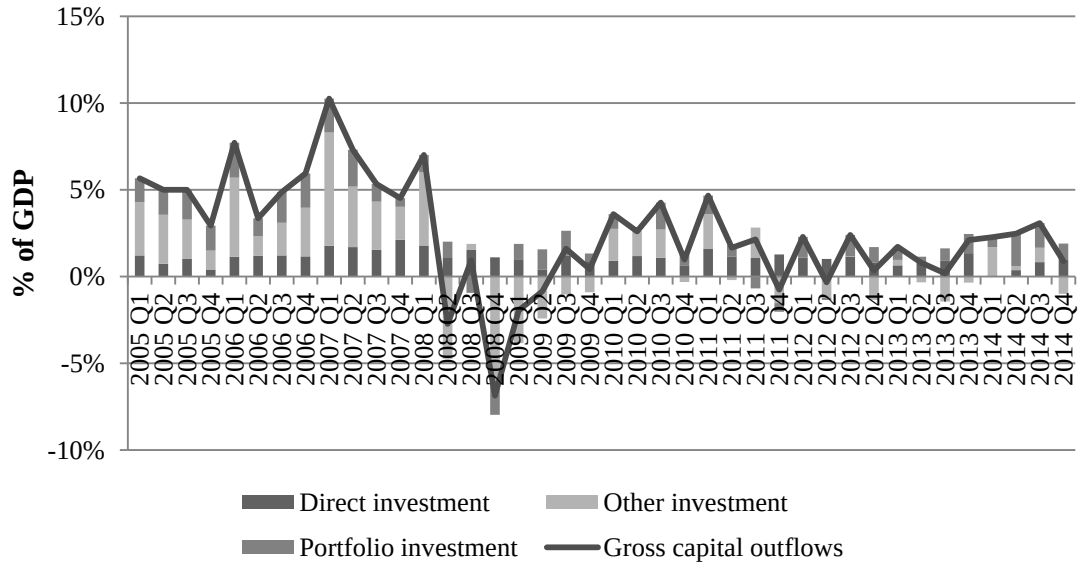
Regarding the fourth phase, it occurred as the market reacted to the possibility of tapering by the FED raised by its chairman Ben Bernanke which induced an increase of long-term interest rates both on U.S. and other AE (IMF, 2013b). This action interacted with internal and external vulnerabilities in NAE, which investors overlooked during

the period of better growth performance when comparing with AE and higher risk appetite (IMF, 2014a, IMF, 2014b), and provoked adjustments in capital flows, asset prices, and national currencies (IMF, 2014e). Even if the adjustment did not configure a sustainable reversal of capital flows during the following period, it could be interpreted as a signal that investors would rebalance their portfolios on a scenario of higher interest rates in AE and higher volatility of capital flows (IMF, 2013c). Smoother decreases of capital inflows were registered in both Latin America and Asia contrasting with the pronounced reduction in the case of EMEA.

In addition to describing the recent experience of NAE, we analyze the gross capital outflows from the AE. We follow Fratzscher (2012) and analyze the capital outflows from AE through figure 2.[7] One can see four different phases: i) a sharp reduction of capital outflows during 2008; ii) a recovery stage during the beginning of 2009; iii) a reduction in the last two quarters of 2011; and finally iv) a decline during the first two quarters of 2013.

This group of economies experienced a sharp decline in gross capital outflows during 2008, with other investment accounting for the greatest of this behavior. In the last quarter of 2008, gross capital outflows from AE registered -6.87% of the GDP.

Figure 2 - Capital Outflows from Advanced Economies



[7] Canada, Euro Area, Japan, United Kingdom, and Unites States.

The sharp contraction in the last quarter of 2008 was followed by a recovery of gross capital outflows in the subsequent periods accounting for 3.6% of GDP in the second quarter of 2010. The recovery was a consequence of the consecutive increase in portfolio investment and other investment outflows. During 2008, FDI outflows remained quite stable, being the only component that recorded positive outflows throughout the period of decline in capital outflows.

During 2009 and 2010, the capital outflows in AE recorded an increase namely regarding portfolio and other investment. This behavior of capital outflows of AE mirrored the increase of capital inflows to NAE. During the last two quarters of 2011 and the last two quarters of 2013, gross capital outflows from AE decreased as result of the Eurozone crisis and the tapering talk by the Federal Reserve (Fed), respectively.

3. Literature review on monetary policy and capital flows

3.1 Implementation of monetary policy

Prior to the GFC, monetary policy was conducted in a relatively predictable and systematic way (IMF, 2013a), following a wide variety of macroeconomic indicators that could be transformed in the Taylor rule (Jayce, Miles, Scott, & Vayanos, 2012). During that period, although several studies were undertaken towards improve our understanding about the channels by which monetary policy operates, the process by which these policies affect the economy was long, variable and included several uncertain lags (ECB, 2000). Thus, the precise effects of monetary policy were difficult to predict (ECB, 2000).

[Figure A4]

As a monopolist of base money, the central bank can fully determine the official interest rates. Generally, "monetary policy mainly acts by setting a target for the overnight interest rate in the interbank money market and adjusting the supply of central bank money to that target through open market operations." (Smaghi, 2009). The manipulation of short-term interest rate affects initially financial market conditions as changes of the policy interest rate affect the money market interest rate, asset prices, exchange rate, general liquidity and credit conditions in the economy (ECB, 2000). In a later moment, changes in financial conditions lead to changes in nominal spending by households and firms (ECB, 2000). Additionally, when central banks affect short-term interest rates the policy affects market expectations regarding longer-term interest rates as long-term interest rates depend in part on market expectations about the future course of short-term rates (ECB, 2000). Moreover, monetary policy may also influence the actual behavior of economic agents: consumption and investment decisions in general take into account the expectations of future inflation and general economic developments. Because the manipulation of short-term interest rate affects the general price level in the long-run, it will consequently affect the conditions in which agents decide their consumption and investment (ECB, 2000).

However, this way of conducting monetary policy is limited by the zero lower bound: the successive reductions in interest rate can, potentially, lead the central bank to

a scenario where it "can no longer stimulate aggregate demand by further interest-rate reductions and must rely instead on non-standard policy alternatives" (Bernanke, Reinhart, & Sack, 2004). In such a scenario, reserves at central bank and short term assets are nearly perfect substitutes which means the central bank's monetary policies through those instruments are nearly irrelevant (IMF, 2013a).

When the zero lower bound is reached, and consequently the manipulation of short term rates is severely limited, there are policy alternatives so central banks are still able to provide additional monetary stimulus (Bernanke *et al.*, 2004). Following Bernanke & Reinhart (2004), it is possible to group the non-standard measures into three distinct groups: 1) shape of public expectations through communication regarding the future path of interest rates, 2) changes in the composition of the central bank's balance sheet; and 3) increases of the central bank's balance sheet. Even if these measures are different in their nature, their main goal is common: to improve financing conditions beyond the manipulation of short-term interest rates by targeting the cost and supply of external finance to banks, households, and non-financial companies (Smaghi, 2009). The details of these non-standard measures, especially the increase of central bank's balance sheet, vary across central banks and depend, naturally, on the structures and characteristics of the respective economies and the motivations of each action (Fawley & Neely, 2013).

Exploring the different ways by which central banks could increase their balance sheets, we will follow Smaghi (2009) and distinct the forms central banks could expand their balances:

Quantitative easing: describes the set of policies that aim to increase the magnitude of central bank's liabilities (Neely, 2010). When doing so, central banks can purchase any type of assets from anybody; traditionally, quantitative easing focuses on buying longer-term government bonds. There are two main reasons for this: the first one is that sovereign yields are used by the private sector as a benchmark to the issuance of securities. If the acquisition of bonds succeeds in lowering sovereign yields, it would be expected yields of private securities to decrease. The second reason is that if long-term yields decrease, that could affect long-term agents' decisions, namely long-term investment (Smaghi, 2009).

This type of expansion of the balance sheet is highly dependent on the action of the private sector after they sell the assets they possess. If the additional liquidity is remains within the financial sector, quantitative easing may be ineffective (Smaghi, 2009).

Credit easing: is intended to repair liquidity shortages in specific market segments through a mix of loans, not only for financial institutions but also for the household and the business sectors, and the acquisition of assets. The effectiveness of the operations depend on the importance of those market segments in financing households and the business sector, which is a specific characteristic of each economy, and on how those monetary actions will improve the functioning of private credit markets.

Indirect Quantitative easing/Credit easing (Enhanced credit support): an alternative way to increase the balance sheet, which does not imply the central bank to hold the assets until maturity, is lending directly to banks at increased maturities against collateral that includes assets whose markets are temporarily impaired. If these operations are able to satisfy banks' financing needs, it could happen that each action affects directly the yield curve over the action horizon, particularly if the operations are conducted at a fixed rate, full allotment. It should be noted that the monetary base is determined endogenously by the banking system depending on the banks' preference for liquidity. Additionally, by enlarging the accepted collateral, the financing conditions by banks to those sectors are facilitated as is also facilitated the creation and trading of the assets whose market is impaired.

But which are the channels through which UMP works? To assess this question I refer to the work of Bowdler & Radia (2012). Regarding this question, they explore three main channels: portfolio rebalancing, liquidity, and policy signaling.

Portfolio rebalancing: by acquiring assets from the private sector, the central bank affects the portfolio decisions of those who sell the assets, giving them money in exchange of the assets. If the assets the private sector sells and the money received are viewed as perfect substitutes, the transmission mechanism ends here because the portfolio balance remains and agents will not need to rebalance it. Because at the zero lower bound money and short-term bonds are perfect substitutes, central banks focus on buying other assets that are less substitutes for money. And this is where the portfolio

rebalancing channel enters. If two assets are imperfect substitutes, changes in the outstanding amounts of both will induce agents to rebalance their portfolio with that action having consequences on asset prices. On a zero lower bound scenario, the objective is that agents rebalance their portfolios into assets with longer maturities in order to decrease the price of those assets. The effectiveness of this channel is surely dependent on the degree of substitutability between assets: the higher the substitutability, the less effective the mechanism will be.

There is some literature regarding the effect of the balance sheet expansion on long-term yields. D'Amico & King (2013) study the effect of the first round of the large scale asset purchase (LSAP) program on the US Treasury yield curve and concluded the program contributed to a persistent decline of 30 basis points of the yield curve and a temporarily reduction of 3.5 basis points in the sector where the purchases are made, both effects concentrated on medium term maturities. Wu (2014) examines the mechanisms through which unconventional measures affect long-term interest rates and concludes LSAP programs lowered long-term yields. However, the effectiveness is not the same in all the programs, being similar during the first round of quantitative easing (QE), the second round of QE, and Operation Twist and decreasing during the third round of QE. This article also contributes to the literature regarding the portfolio rebalancing channel by concluding that continuing LSAP programs enhanced the credibility of forward guidance.

Despite the fact that generally the literature focuses on US programs, there are some studies on the effects of the policies of other central banks, such as the ECB (ECB). Szczerbowicz (2012) assesses the effects of ECB's UMP between 2007 and 2012 on bank and government borrowing costs through an event-based regression. The Securities Market Programme (SMP) proved to be the most efficient tool in order to lower sovereign spreads with its effects going from 35 basis points (Italy) to 476 (Greece), hitting more effectively the peripheral euro-area economies. Furthermore, Eser & Schwaab (2013) found a lower but significant impact of SMP on 5-year maturity bond yields from 1 to 21 basis points, with Greece being the country that benefited the

most. The precise impact, the authors concluded, depends on the size and market conditions as well as on the default risk.

Even if the main literature regarding quantitative easing's portfolio rebalancing channel concentrates on bond yields, Jarrow & Li (2012) purpose is to estimate the impact of quantitative easing on U.S. interest rate term structure. Their main conclusions is that short and medium term forward rates up to 12 years decreased, with the magnitude of the effect decreasing as the maturity increases. Contrary to the Fed's intentions, the long term structure was not affected. Finally, the results regarding the effect of 2008-2011 monetary policy on bond yields are consistent with those presented in the existing literature as D'Amico & King (2013) and Krishnamurthy & Vissing-Jorgensen (2011): the actions from the Fed caused a persistent decrease in bond yields at all the maturities.

Liquidity channel: during times of financial stress, agents could ask for a liquidity premium to compensate for the risk of holding assets that could not have an active market where the assets could be transacted. Theoretically, asset purchases by central banks are intended to reduce the liquidity premium. The impact should be higher as less liquid is the market. We present the work of Gagnon, Raskin, Remache, & Sack (2011) and Krishnamurthy & Vissing-Jorgensen (2011) as empirical studies regarding this specific channel: on the one hand, the first study concludes that the actions from the Fed improved liquidity in mortgage-backed securities market by providing a consistent source of demand; on the other hand, the latter work concludes the same actions lowered credit risk premium in corporate bond markets.

Signaling channel: revealing information about the future path of monetary policy could influence long-term interest rates, as the monetary authority signals the market that it expects policy rates to remain lower for a certain period of time. When combined with asset purchases, this channel may help the authority to demonstrate its commitments. Neely (2010) studies the possibility that LSAP announcements affected US long-term interest rates concluding for a substantial reduction of interest rates in the period following the announcements. Krishnamurthy & Vissing-Jorgensen (2011) conclude QE operates through the signaling channel, with larger effects on medium

term than long-term yields. During QE1, the signaling channel contributed to a reduction of 20 to 40 basis points on 5 to 10 years yield bonds. When looking to the second action of QE, signaling channel is found to have lowered 5 years bond yields by 11 to 16 basis points and lowered 10 years yield bonds by 7 to 11 basis points. Bauer & Rudebusch (2014) provide evidence that this channel had positive and statistically significant effects on the first FED's LSAP program by lowering the long term interest rates. These findings concur with those of Wu (2014), who contributes by concluding that continuing LSAP programs enhance the credibility of forward guidance.

However, there is also literature on possible perverse effects of signaling channel on monetary policy's efficiency. If agents put too much trust on the announcements and ignore other relevant information that might influence the future path of interest rates, those announcements could be interpreted within an herding and overreaction environment (Kool & Thornton, 2012).

3.2 Monetary policies

In this section we will summarize the differences on the monetary actions[8] in the post-crisis period carried out by the central banks of the G4.[9] The objective is to reflect why we argue that it may be adequate to capture those actions by the variation of the balance sheet.

The four central banks adapted their UMP to the structure of their economies (Fawley & Neely, 2013). Even if the objective was to provide liquidity and support the financial system, the framework of each action and its implementation reflected the different specificities of the economy. Briefly, it can be said that both the program of the Fed and that of the BoE (BoE) differed from those of the ECB and that of the BoJ (BoJ) given the importance of the bond market in financing the economy in the former group comparing with the importance banking system in the latter group (Fawley & Neely, 2013).

Following the Lehman Brother's bankruptcy in September 2008, monetary institutions promptly faced a scenario of illiquidity and increase in risk premium. The first action on September, 18, was the expansion of the foreign exchange swap lines by the Fed – that was carried out on October, 13, in coordination with the ECB, the BoE and the BoJ among others – with the objective of supplying foreign currencies to US institutions and providing US dollars to external institutions. This action was latterly revised and changed in order to accommodate any quantity of funds demanded. In the same period, the Federal Reserve created the Asset-Backed Commercial Paper (ABCP), the Money Market Mutual Fund Liquidity Facility, which lent money to banks for the purpose of purchasing high-quality ABCP. Additionally, the Commercial Paper Funding Facility was created with the objective of acquiring high-quality commercial paper and so was the Term Auction Facility with the objective of providing liquidity to

[8] The announcements referred during this chapter can be consulted on table A2 to A5. In footnote will be referenced announcements that complement those presented on the tables with additional information.

[9] We focus on these four economies for several motives: firstly, these economies play a central role on the direction of capital flows as they act as financial centers, intermediating funds globally. Additionally, since G4 financial systems intermediate much of the global credit, monetary actions in these economies with impact on funding conditions will affect funding conditions globally. Furthermore, the central banks of these economies are among the ones which pursued the most accommodative monetary policies in the post-crisis period as we review here. Finally, these economies represent four of the five largest economies in the world, considering by monetary zone.

depository institutions in exchange for a broader set of collateral in times at which interbank markets were under stress. On November 25, 2008, the Federal Reserve announced that it would start to purchase $100 billion in government-sponsored enterprise (GSE) debt and $500 billion in mortgage-backed securities (MBS) issued by GSEs. The objective was said to reduce the cost of credit and, at the same time, increase the availability of credit for those who intended to purchase houses, which would consequently improve housing market and financial markets in a broader (Fawley & Neely, 2013).

During the same period, on October 15, 2008, the ECB implemented the Fixed Rate Full-Allotment program in order to provide liquidity to the European banking system against a broader set of eligible collateral. This action differed from the previous way of conducting monetary policy that was intended to offer funds at rates determined by the bidding process. Despite the Fixed Rate Full-Allotment, the interbank market continued to face concerns regarding the counterparty risk by early 2009 (Fawley & Neely, 2013). On May 7, 2009, the ECB reduced its main refinancing rate to 1%, introduced 12-month long-term refinancing operations, and introduced the Covered Bond Purchase Program. Regarding to the latter action, it must be said that given its characteristics "Issuing long-maturity covered bonds helps banks to alleviate the maturity mismatch they usually face between the long-term loans they hold as assets and the on-demand deposits they hold as liabilities." (Fawley & Neely, 2013). Given the stress this market registered following the bankruptcy of the Lehman Brothers and the importance of the market on funding the European banking system, the ECB announced the purchase of €60 billion of covered bonds.

In order to counteract the worsening of the financial conditions that small and large firms faced during the last quarter of 2008, the BoJ announced on December 2, 2008, that it would start to provide unlimited credit to banks at the uncollateralized overnight call rate - which at that time was 0.3%. Additionally, the Bank eased the quality of corporate debt accepted as collateral from "A-rated or higher" to "BBB-rated or higher". Like the Fixed Rate Full-Allotment program carried out by the ECB, these actions emphasize the importance of the banking system in financing the Japanese

economy. Additionally, on December 19, 2008, the BoJ decided to decrease the overnight rate to 0.1% as well as to expand the outright purchases of Japanese government bonds and introduce additional measures to facilitate corporate financing. On January 22 and February 19, the BoJ announced reverse-action purchases of ¥3 trillion in commercial paper and ¥1 trillion in corporate bonds, respectively.

On January 19, 2009, Her Majesty's Treasury announced the Asset Purchase Facility that was intended to be operated by the BoE. This facility was designed to achieve two distinct objectives: to increase the availability of corporate credit, by reducing the illiquidity of the underlying instruments and to provide monetary stimulus in order to achieve the inflation target. Because the £50 billion purchase of high quality private sector assets was financed by the issuance of Treasury bills, these actions did not increase the monetary base. On March 5, the BoE announced that the Asset Purchase Facility would start to be financed by central bank reserves rather than by the issuance of treasury bills and that the increase in the monetary base would be £75 billion and later of £200 billion. The Bank directed the purchase of assets to medium and long-term assets of illiquid markets.

Summarizing, although each of the central banks announced the outright asset purchases in the post-crisis period, the ECB and the BoJ only acquired a small amount of a particular asset (Fawley & Neely, 2013). These central banks acted mainly through loans to their banking system; on the contrary, the Fed and the BoE implemented large acquisitions of assets. The improvement of market conditions led central banks to phase out their programs (Fawley & Neely, 2013).

However, the European sovereign debt crisis and deflationary trends in the US, the UK and Japan revived the necessity to employ UMPs. In May 2010, the evolution of the sovereign debt crisis disrupted European financial markets. In order to ensure the depth and the liquidity of public and private debt securities markets, the ECB announced on May 10, 2009, the Securities Market Programme. The objective of this action was to ensure the adequate functioning of the monetary policy transmission mechanism and consequently ensure that the ECB was able to achieve the goal of price stability by acquiring government debt in the secondary market. Those purchases were intended to

be sterilized which prevented the program to increase the monetary base. On October 6, 2011, a second round of the Covered Bond Purchase Program and additional 12-month long-term refinancing operations were announced. Later, on December 8, the ECB announced that it would conduct for the first time long-term refinancing operations with maturity of 36 months in order to support bank lending and liquidity in the money market. On September 6, 2012, the ECB announced the Outright Monetary Transactions to replace the Securities Market Programme. The new program was still intended to work through the sterilized acquisition of sovereign debt in the secondary market but it became conditional to a European Financial Stability Facility/European Stability Mechanism program. In order to support bank lending to households and non-financial institutions, the ECB announced on June 5, 2014, targeted longer-term refinancing operations with a maturity of nearly 4 years. Additionally, it was announced that sterilizations of the operations under the Securities Market Programme were suspended. Three months later, on September 4, 2014, the ECB reflected the importance of the asset-backed securities' market on financing the European economy and announced an asset-backed securities purchase program. And a third edition of the covered bond purchase programme was also announced. At that announcement the measures were said to be expected to have a sizeable impact on the balance sheet of the central bank.

Regarding the BoJ, on December 1, 2009, it was announced that the Fixed-Rate Operations would replace the Special Funds Supplying Operations. The main differences between the two actions lay on the fixed amount of available loans on the announced program and the broader class of eligible collateral (Fawley & Neely, 2013). The objective of this action was to promote a reduction of long-term interest rates in order to support Japan's growth and avoid the deflationary trend. Additionally, on June 15, 2010, the BoJ announced the full details of the Fund-Provisioning Measure to Support Strengthening the Foundations for Economic Growth program. [10] The objective of the program was to make long-term funds available at low rates to those private financial institutions that would be looking forward to lend those amounts to the corporate sector. On June 14, 2011, and March 13, 2012, the BoJ decided to expand this

[10] The announcement could be seen at http://www.boj.or.jp/en/announcements/release_2010/k100615.pdf

program given the positive impact of the previous action in promoting investment with capacity to increase the potential growth. The total amount available for private financial institutions increased from ¥3 billion in the first program to ¥5.5 billion in the latter. Furthermore, the BoJ announced additional purchases of ¥60 trillion in Japanese governmental bonds and Treasury bills and ¥1 trillion in private assets as part of its APP. On January 22, 2013, the BoJ decided to implement a price stability target at 2% in terms of the year-on-year rate of change in the consumer price index. In order to achieve this objective as soon as possible the BoJ announced that it would pursue aggressive monetary easing. This program was denominated Quantitative and Qualitative Monetary Easing and was oriented to increase the monetary base at an annual pace of ¥60 to ¥70 billion and to acquire Japanese governmental bonds at an annual pace of ¥50 billion and Japan real estate investment trusts at the amount of ¥30 billion per year.

Slower recovery in output and employment and subdued inflation trends induced the Federal Reserve to act on August 10, 2010, by maintaining the size of the balance sheet and reinvesting the principal payments of the long-term asset purchases. On September 21, 2010, the Federal Reserve enhanced its intention to reinvest the principal payments due to expectation that inflation would remain subdued for a long period of time. Additionally, on November 3, 2010, it was announced that the Federal Reserve would acquire $600 billion of long-term Treasury bills in order to support the real activity and to drive inflation to the stability path consistent with its mandate. These actions were designed to achieve its objectives through the reduction of long-term interest rates. On the second semester of 2011, economic growth on the U.S. remained slow with the overall labor market conditions continuing to be weak. In order to seek maximum employment, the Federal Reserve announced, on September 21, what has been called the “Operation Twist”: it would purchase $400 billion of Treasury securities with remaining maturities of 6 years to 30 years and would sell the same amount of Treasuries securities in its possession with remaining maturities of 3 years or less. This action was intended to enhance the decrease of long-term interest rates as well as ease broader financial market conditions. On June 20, 2012, the Federal Reserve announced

that it would enhance the acquisition of long-term Treasury assets at the same time that would sell the same amount of short-term Treasury assets. On September 13, the Federal Reserve made clear that economic growth would not be strong enough to generate sustained improvement in labor market conditions without further policy accommodation. Additionally, the strains in global financial markets were said to continue to retard world economic growth. In order to boost economic growth and help ensure that inflation would be consistent with its mandate, the Federal Reserve announced further easing of monetary policy by purchasing additional agency mortgage-backed securities at a pace of $40 billion per month. This detail is the main difference regarding the previous programs: the Federal Reserve committed itself to a pace of monthly purchases rather than a total amount of purchases (Fawley & Neely, 2013). The purchases were to be undertaken as long as the conditions of the labor market would not improve substantially. For instance, this action would be reversed when the economic activity as well as the unemployment would recover consistently – that is what was firstly announced on December 18, 2013, and was systematically communicated until December 2014. The consistent improvement in economic activity and labor market conditions were sufficient to decrease the monthly purchase of mortgage-backed securities from $40 to $5 and the monthly acquisition of long-term Treasury securities from $45 billion to $10 billion.

Regarding the BoE, the apprehension that the inflation target would not be achieved instigated the Bank to react by announcing on October 6, 2011, an increase from £200 billion to £275 billion on the asset purchases as part of the Asset Purchase Facility. On February 9 and July 5, 2012, the BoE further increased the amount of purchases to £325 and £375, respectively. Additionally, in order to ease the flow of credit through the banking system, which remained impaired in 2012, the BoE announced on July 13, 2012, and expanded on April 24, 2013, the Funding Lending Scheme. The objective of this action was to reduce the price at which financial institutions finance themselves, and therefore reduce the price at which those institutions finance households and the corporate sector.

To sum up, from 2008 to 2014 there were two distinct phases during which central banks carried out UMPs. Firstly, in order to calm and increase the liquidity in financial markets, from 2008 until 2010 and after the zero lower bound was reached, these central banks acted through the purchase of assets, with this policy being more important in the case of the Federal Reserve and of the BoE, and through the increase of the available amounts to lend to the financial institutions, namely in the case of the ECB and the BoJ. Secondly, from 2010 until 2014, the central banks carried out UMPs for different reasons. It is possible to categorize these reasons in two different groups: actions that aimed to deal with the Eurozone crisis and actions aiming to support economic growth and ensuring that inflation meets the defined target. The ECB focused on restoring the functioning of securities market and supporting the banking system given its importance in financing the economy. The Federal Reserve, the BoJ and BoE eased their monetary policy in order to prevent disinflationary trends and support economic growth.

Even if those policies were conducted with different motives, they generally resulted on the expansion of the central banks' balance sheet as demonstrated by Gambacorta, Hofmann & Peersman (2014) and Kozicki, Santor, & Suchanek (2011). During this period, the increase of the balance sheet replaced short-term interest rates as the main monetary policy instrument. As argued by Gambacorta *et al.* (2014), given the evolution of the central banks' balance sheet after short-term interest rates reached the zero lower bound and the strong cross-country commonality of central banks from AE in conducting the monetary policy after the global financial crisis through balance sheets, we consider that it is adequate to capture those policies on a broader way through the evolution of the aggregate balance sheet of these central banks.

3.3 Capital flows

The free movement of capital across countries is beneficial as it promotes the productivity and growth of those who receive those flows and allows countries to anticipate future increases on GDP (Epstein, 2009), contributing for a possible acceleration of the convergence between capital-poor countries and capital-rich countries (Lucas, 1990), and concedes the opportunity to apply the surplus of saving on countries with higher return on capital (Kose, Prasad, Roggof, & Wei, 2009). At a micro economic level, capital flows might be able to enhance the efficiency of resource allocation and the competitiveness of the domestic financial system (IMF, 2012). Moreover, opening the capital account may act as a way to discipline policymakers and their actions regarding macroeconomic policies as the liberalization influences sovereign risk premium when fiscal policies tend to be unsustainable (Montiel, 2014). Nonetheless, the literature broadly agrees that large capital flows can be the starting point for excessive risk taking by financial institutions and for macroeconomic imbalances, including increase of macroeconomic volatility, and additional vulnerability to crises (IMF, 2012).

The study of the determinants of capital flows and its volatility is essential so policymakers can understand and evaluate the negative effects of international capital mobility (Alfaro, Kalemli-Ozcan, & Volosovych, 2007). In any situation, policymakers should evaluate the country's specific vulnerabilities and examine what the potential policy response to a tightening of global financial conditions should be. Countries with strong fundamentals and investors' confidence "(…) may be able to rely on market mechanisms, countercyclical macroeconomic and prudential policies to deal with a retrenchment of foreign capital" (Burns *et al.*, 2014). Contrarily, countries that carry weaker fundamentals and external imbalances may be forced to tighten their fiscal and monetary policies in order to reduce their financing needs.

There is a continuing debate in the literature about the driving forces of capital flows, with this discussion being one of the most important issues in the international macroeconomics literature (Alfaro *et al.*, 2007). Generally, the literature distinguishes two groups of factors: push factors, which relate to economic and financial conditions

outside the receiving country, such as global interest rates or the growth of world GDP, and pull factors, which include economic and financial conditions in the receiving country. The study of those factors is relevant for policymakers, both in AE and NAE, that face challenges related with the impact of capital flows on the stability of the financial system and domestic economy. These studies can be useful for the implementation of macroeconomic prudential reforms.

There is no general agreement on whether capital flows are mainly driven by push factors or by pull factors. As stated by Alfaro *et al.* (2007), the fact that there is no consensus about this issue is due to differences on the sample, different time periods, and differences regarding the forms of capital flows studied. In the early 1990s, evidence suggested that the push factors supplanted pull factors (IMF, 2011a). Since the early 2000s, the literature has been focusing on the influence of pull factors on determining capital flows. The main conclusion is that both push and pull factors matter in driving capital flows (Montiel, 2014).

Chuhan, Claessens, & Mamingi (1998) study whether the capital flows to Asian and Latin American economies from 1988 until 1992 were driven by push factors or by pull factors. They conclude that both drivers are important in order to explain the flows. However, its importance varies across regions and components. Global factors are, indeed, more important to explain capital flows to Latin American economies while, on the contrary, country-specific factors are much important in explaining capital flows to Asian economies.

Fostel & Kaminsky (2008) examined which factors were relevant in explaining Latin American economies' access to international financial markets between 1980 and 2005. Their work focuses on gross issuance of bonds, equity, and syndicated loans and its goal is to understand if the access to international financial markets is mainly driven by domestic factors - good behavior - or external factors - global liquidity. Overall, the external factors explain the access of Latin American economies to a higher degree than domestic factors do. Apparently, "the boom-bust pattern in international issuance has been mainly driven by fluctuations in global liquidity and investors' changing risk behavior" (Fostel & Kaminsky, 2008).

In addition, Förster, Jorra, & Tillmann (2014) examine the degree of co-movement of gross capital inflows using a dynamic hierarchical factor model to decompose gross capital inflows into global factors, factors specific to a particular type of capital inflows, regional factors, and country-specific factors. Overall, the latter set of factors is the one that contributes the most to explain the driving forces behind capital flows, accounting for 60% to 80% of the dynamics. Furthermore, the results allow the authors to conclude that regional factors explain about 5% to 20% of capital flow's fluctuations. Finally, the authors conclude that global factors only explain a residual portion of the overall variation.

Besides the distinction of the influence of push and pull factors, the literature has been focusing on the importance of individual variables in explaining capital flows.

The size of the economy, whether measured by GDP per capita or total GDP, is usually used as a determinant of capital flows in order to test the hypothesis that bigger economies attract higher levels of capital flows. This effect is found to significantly and positively affect capital flows: Faria & Mauro (2009) and Alfaro, Kalemli-Ozcan, & Volosovych (2008) for instance confirm this effect. However, other studies, as Alfaro *et al.* (2007), found no evidence of this effect. When the literature switches its attention to the GDP growth, whether per capita or not, in order to capture the difference in growth prospects and possible cyclical differences between GDP growth of the domestic economy and that of a foreign economy, or a group of economies, the results are even more unequivocal in confirming the positive correlation between GDP growth and capital flows – Milesi-Ferretti & Tille (2011), Mercado & Park (2011), Cerutti *et al.* (2014), and Förster *et al.* (2014) support this hypothesis.

Among the broad array of factors that the literature pines down as explaining capital flows is the interest rate differential between the domestic and the foreign economy, usually the USA, or an aggregate of economies (e.g. see Mercado & Park, 2011 for the former and Nier *et al.*, 2014 for the latter). This variable's objective is to capture the Mundell-Fleming's capital mobility effect due to differences in interest rates (Mark, 2000). Taylor & Sarno (1997) argue that falls of interest rates in the United States encouraged investors to shift their investment decisions to Latin America and Asian

economies in pursuit of high-yield investments during the period 1988-1992. Accounting for portfolio flows, the authors find that a rise in external interest rates influences both short-term equity and debt portfolio inflows. Additionally, Nier *et al.* (2014) found a significant positive effect of the short-term interest rate differential on gross inflows excluding FDI as a share of GDP, when controlling for a series of other variables. When controlling for fewer variables, the differential is not significant. However, Mercado & Park (2011) found no evidence that total inflows were significantly affected, either for emerging economies or for developing Asian economies, during the period 1980-2009. This conclusion holds even when looking at subcomponents of the financial account, such as FDI, portfolio investment, or other investment. Carlson & Hernandéz (2002) find evidence of the same effect regarding the largest recipients of capital flows during the 1990s: capital inflows received by these economies were not affected by the interest rate differential. Again, this result holds even when studying the subcomponents of the financial account. Finally, Cerutti *et al.* (2014) concluded that the interest rate differentials are not significant in explaining cross-border bank flows during 1990-2012.

Theoretically, the literature argues that trade openness to be positively related with capital flows, as international trade may imply the transaction of financial instruments in order to finance the trade flow or hedge any type of risk, such as foreign exchange risk or interest rate. Additionally, Martin & Rey (2006) argue that trade openness increases the resilience to financial crises: countries with a higher degree of international trade have profits and dividends that are less dependent on local income. Given so, an exogenous reduction in the national income will have a lower impact on the price of financial assets and capital flows because trade openness will counteract the initial effect. Cavallo & Frankel (2008) find that trade openness make economies less vulnerable to sudden stops and currency crashes arguing that higher ratios of trade in % of GDP decreases the required adjustment when international financing is cut-off.

In the theoretical model of Heckscher-Ohlin with two countries with identical technologies, differing factors endowments and free trade in goods, but not factors, trade and capital flows are perfect substitutes: factor prices are equalized in the two

economies after trade (Feenstra, 2003). The fact that trade openness is a perfect substitute for capital flows would result in a negative relation between the two variables (Antràs & Caballero, 2009). Additionally, Mundell (1957) treats the substitutability between trade and capital differently: in a world with two economies, both with a homogeneous production function, with only two possible products that can be produced with each of the products requiring a greater portion of one factor than the other commodity at any factor prices and with no possible specialization due to factor endowments, impediments imposed to trade increase factor movements and impediments imposed to factors increase trade movements. Finally, there is a vast literature that assesses the importance of trade linkage as a mechanism of propagation of financial crises. Forbes & Warnock (2012) assess the importance of the trade channel on identifying episodes of surges, stops, flights and retrenchment of capital flows concluding for an important role of trade linkage explaining crises contagion. While Faria & Mauro (2009) and Fostel & Kaminsky (2008) have found a positive relation between trade openness and capital flows, several studies rejected that relation between trade openness and capital – see, e.g., Mercado & Park (2011), Okada (2013), Alfaro *et al.* (2007) and Förster *et al.* (2014).

Another well-explored idea is the hypothesis that human capital affects capital flows. This hypothesis was first introduced in order to try to explain the Luca's Paradox: why does capital not flow from rich to poor countries as the neoclassic theory predicts? Lucas (1990) argues the paradox can be partly eliminated by considering differences in human capital, as the incorporation of this factor in the neoclassic model decreases significantly differences in rates of return between rich and poor economies. However, differences subsist large enough to become a paradox as the incorporation of human capital does not explain completely why capital does not flow to countries with higher rates of return. Alfaro *et al.* (2007) find evidence that human capital is highly significant in explaining equity and debt inflows per capita – as significant as GDP or institutional quality. Faria & Mauro (2009) confirm the effect of human capital on equity components of capital flows and give new insights regarding the effect: the level of human capital affects the composition of capital flows. Countries with higher levels

of human capital tend to present external liabilities structures with higher shares of equity flows. Borensztein, De Gregorio & Lee (1998), studying possible relations between FDI and output growth, placed special attention in the role of human capital. It was found that the FDI's effect on GDP growth is dependent on the level of human capital – the higher the level of human capital, measured by the level of educational attainment, the higher the contribution of FDI to economic growth. The authors conclude human capital enhances the efficiency of FDI on promoting GDP growth. Noorbakhsh, Paloni, & Youssef (2001) study the hypothesis that educational policies with the objective of raising the level of human capital might enhance the country's FDI attractiveness. The authors, following Lall (1998), conclude that countries which rely on low-cost human capital are less able to attract high added-value FDI, slowing the potential effect of FDI on output growth.

Similarly to corporate finance literature, there is a growing literature that relates the role of institutions with a country's structure of external debt. Albuquerque (2003) models capital flows under a scenario where international financing contracts lack the proper mechanisms to enforce payment and inalienability of FDI. The former is argued to create financing constraints, proxied by increases in credit risk, and the latter implies that to expropriate FDI is not advantageous relatively to other capital flows. Faria & Mauro (2009) dedicated special attention to the role of institutions. Looking at total equity, portfolio equity, and FDI, the authors conclude institutional quality, measured by the Worldwide Governance Indicators index constructed by Kaufmann & Mastruzzi (2004), is significantly and positively associated with total equity, portfolio equity and FDI. The results support the idea that the higher is the institutional quality the more the capital structure of a country tends to move in favor of FDI over debt: in other words, the higher the institutional quality of a country the higher is the share of FDI on the attracted flows and the fewer is the portion of debt. Alfaro *et al.* (2008) revisit Luca's paradox and raise the possibility that institutions, through the protection of private property and by preventing the blocking of the adoption of new technologies, affect productivity and market returns and consequently the economic growth and capital flows. These results are in line with those obtained by Papaioannou (2009) regarding

the influence of institutional quality in explaining the Luca's paradox: institutions can explain part of Lucas' paradox. Even if individualy it is not found to be significant, Okada (2013) found that institutional quality has expressive interaction effects with financial openness: the effect of institutions on capital flows increases with financial openness.

Besides institutional quality, the growth of monetary aggregates was also used on models that assessed the determinants of capital flows, as a proxy of global liquidity. The hypothesis the literature tests is based on the possible positive effects of increases of global liquidity on capital flows. Mercado & Park (2014), using the growth of broad money (M2) weighted for the GDP of the 20 largest economies, reject this hypothesis for the case of total inflows to emerging economies from 1980 to 2009. Additionally, Cerutti *et al.* (2014) find evidence of a positive and significant relation between the growth of money aggregates in the G4 economies (Euro Area, Japan, US, and UK) and bank flows to AE and NAE. Rodrik & Verdasco (1999) assessing which factors contribute to explaining the maturity structure of debt found M2 in % of GDP to have a consistent and robust effect over the ratio of short-term debt to total debt. However, Lim, Mohapatra, & Stocker (2014) proxy the global liquidity by the level of the U.S. M2 finding that this effect on gross inflows to developing countries is indistinguishable from zero. Regarding FDI inflows, foreign portfolio investment inflows, or even other investment inflows the hypothesis is also rejected by Mercado & Park (2014).

Another well-established effect on capital flows is that of global risk aversion, usually proxied by the VIX.[11] Theoretically, swings in investment sentiment – between risk-on and risk-off – are expected to influence the rebalancing of portfolios as increases in uncertainty and risk aversion tend to decrease the agents' investment decisions (Powell, 2010). Fratzscher (2012) finds the VIX to be highly significant regarding net portfolio inflows for emerging economies, both before and after the 2008 crisis, and regarding bond portfolio flows, both for advanced and emerging economies. However, this relation does not hold for equity portfolio flows, for which the VIX is only found to be significant for AE. Ahmed & Zlate (2014) obtain results in line with those of

[11] The VIX measures the implied volatility of S&P 500 index options.

Fratzscher (2012): they concluded that total portfolio flows was significantly affected by the VIX during the entire period of 2002-2012; while total net inflows are not found to be correlated with the VIX. Burns *et al.* (2014) and Lim *et al.* (2014) are also in line with these results: the VIX was found to be significant regarding portfolio and debt inflows. Additionally, those authors find that it was also correlated with gross financial inflows for the 2000-2013 period. Nier *et al.* (2014) made their contribution regarding this topic focusing particularly on the effect of the global financial cycle measured by the VIX on capital flows and the relation between the VIX and other macroeconomic variables. The results provide new insights about this subject, raising the possibility that the VIX affects capital flows non-linearly. When the VIX is low, fundamentals are the most important variables explaining the flow of capitals. Contrarily, the higher the VIX the higher its importance in explaining capital flows, supplanting fundamentals. Here, the interest rate differential is the exception. Additionally, the effect of the VIX on capital flows is positively related with the degree of capital mobility. Dividing the sample in a pre and post-crisis period, the results follow the hypothesis of the VIX's nonlinearity. In fact, the VIX is larger on the post-crisis period which is consistent with the interaction model presented by the authors: the higher the VIX the higher its importance in explaining capital flows.

Based on Ando & Modigliani (1963), De Santis & Lürhmann (2006) test the hypothesis that differences in country's demographic structure drive capital flows since economies with younger and older demographic structures are characterized by having lower saving rates. Furthermore, those countries tend to have a higher investment demand, as shown by Higgins (1998). In financially integrated markets, countries' demographic differences create an incentive to capital flow to younger and older economies if they offer a higher premium. The authors find that increases, in short and medium term, in youth-age and old-age in percentage of total population relative to the world average are positively associated with increases in net equity inflows; when focusing on net debt flows, this association does not hold, as demographic structure does not appear as significant.

Besides the usual attention the literature places on the volume of capital flows, there is an increasing trend in the literature with the objective to assess which factors explain the volatility of capital flows. Usually, studies on this field try to raise new insights regarding four distinct questions: i) Is there any difference on volatility depending on the type of economy considered, ii) Is volatility driven by global or local factors, iii) Among global and local factors, which is the most significant in explaining volatility and, finally, iv) Are the determinants of the volatility of capital flows the same among the components of the financial account?

To begin with, the literature tends to accept the idea that capital flows are more volatile in emerging economies than in advanced ones. Broner & Rigobon (2004) show that the standard deviation of capital inflows to emerging economies is almost 80% higher than in AE. The authors argue that this happens due to the fact that capital flows to emerging economies are more subject to large negative shocks, that these shocks are characterized by a contagion effect, and finally that these shocks are more persistent than when they occur in AE. The conclusions of Levchenko & Mauro (2007) are in line with those of Broner & Rigobon (2004): the cross-country median of the standard deviation of the financial account is found to be 55% higher in emerging and developing countries in comparison with AE. However, there is some literature that contradicts these conclusions: for instance, Bluedorn, Duttagupta, Guajardo, & Topalova (2013) conclude that the volatility of both gross inflows and outflows is higher in AE, for the diverse components of the financial account.

Regarding whether the volatility of capital flows is driven by global or local factors, Broto, Díaz-Cassou, & Erce (2008) find no evidence that FDI volatility is affected by global factors, contrary to domestic macroeconomic variables such as GDP per capita, reserves, and institutional development. However, push factors are robustly correlated with portfolio investments' volatility: higher levels of world GDP as well as monetary easing conditions are positively associated with increasing levels of volatility. The authors argue the first effect may correspond to competition among agents for funds and the second effect may be consistent with the increase in speculative activities as global liquidity increases. Broto, Díaz-Cassou, & Erce (2011) concluded that during 2000-

2006 global drivers were the prominent factors affecting emerging market capital flows' volatility, reporting a homogenous increasing importance of these drivers in explaining capital flows' volatility since the 2000s. Contrastingly, local factors are rejected to have similar effects on the different components of financial account, possibly affecting the components in opposite ways. This characteristic of capital flow's volatility might increase the complexity of recommendations for economic policy: besides the possible distinct effects, local factors may only be significant regarding one component. In this case, policy recommendations could vary with the component's volatility policymakers may desire to manage.

Regarding which characteristics affect capital flows' volatility, Mercado & Park (2011) study which factors explain how volatility varies across categories of capital flows – trade openness increases the volatility of all categories; at the same time, changes in stock market capital only affect portfolio inflows. In addition, the same factor might affect different categories distinctively: financial openness is found to affect FDI positively inflows and portfolio inflows negatively; this conclusion reinforces the conclusion of Broto, Díaz-Cassou, & Erce (2011). Economies with better institutions were found, by Neumann, Penl, & Tanku (2009) and Broner & Rigobon (2004), to be positively associated with a lower degree of volatility, having improved the ability to avoid adverse effects of larger capital flows due to capital liberalization. Additionally, Neumann *et al.* (2009) found that the effects of financial liberalization on the volatility of net capital flows are not clear: even though the findings reveal that the standard deviation of FDI and portfolio flows increase with liberalization, the significance of the coefficient does not hold regularly. The conclusions of Bogdanov (2014) are in line with those of Neumann *et al.* (2009) as the author finds that the estimated effects of capital account liberalization on net capital flows' volatility is close to zero and not statistically significant, arguing that capital account policies do not have a considerable effect on cooling off the volatility of the financial account. Broto *et al.* (2011) conclude for a significant U-shape relation between economic development and FDI volatility. Additionally, the authors find a quadric relation between economic development and bank flows' volatility.

Last, but not the least, FDI is generally found to be the most stable component of the financial account, as concluded by Alfaro *et al.* (2007) and Mercado & Park (2011). Nevertheless, some argue that FDI is not as stable as the literature generally concludes (Brukoff & Rother, 2007). These authors argue that literature's conclusions are biased by the way FDI data is compiled, being less accurate in capturing posterior capital transactions than in capturing the initial interaction between agents. Furthermore, FDI could mislead literature since data does not capture situations in which agents incur in financial engineering to bypassing capital controls or decreasing taxation significantly.

3.4 Did the global financial crisis cause a shift on the drivers of capital flows?

Some authors explored the idea of a shift on the determinants of capital flows after the GFC. The motivation is to obtain an answer to the following question: did the global GFC cause a shift on the drivers of capital flows?

Milesi-Ferretti & Tille (2011) analyze, with different countries, the drivers of capital flows during the collapse phase (2008:Q4 – 2009:Q1) and the recovery stage (2009:Q2 - 2009:Q4). The main goal was to determine the stylized facts and main drivers of the collapse in the international capital flows in the period following the GFC.

Regarding the collapse stage, the results indicate that the reverse in capital inflows was more severe for countries with larger gross debt positions and larger net liabilities regarding debt instruments. The results also allow the authors to conclude that the collapse was more severe in countries that experienced a faster GDP prior to the GFC and with higher GDP per capita. When looking at the recovery stage, the authors find the results to be generally consistent with the pre-crisis period: countries with larger gross debt positions and slower growth in trading partners experienced slower increases on capital inflows. Overall, the retrenchment of capital flows can be linked to the international financial exposure and, to a lower degree, to macroeconomic variables, especially the performance of trading partners. Countries with higher degree of financial integration and with larger net liabilities positions regarding debt instruments suffered sharper declines in capital flows. With greater difficulty, the retrenchment can be linked to some pre-crisis macroeconomic conditions as pre-crisis GDP growth, GDP per capita, and growth of trading partners.

Fratzscher (2012) studies the causes of the collapse of capital flows in 2008 and the subsequent surge, focusing on the importance of push and pull factors. The author focuses on whether there was a significant change on the determinants of capital flows from the pre to the post-crisis period. The object of study was the portfolio investment flow between October 2005 and November 2010. Countries' external exposure before the GFC, namely through trade and finance, is found to have played a minor role in accounting for the transmission of global shocks. By contrast, fundamentals and institutions contributed to isolate financial markets from adverse and idiosyncratic

shocks during the GFC. One of the main findings of the paper is that global common factors are, during the sample, as important as country-specific factors in explaining net capital flows. Nonetheless, differences are found within region and period of time. Common factors are more important in explaining net capital flows during the crisis, while pull factors seem to be more important in the period after 2009.

Finally, Ahmed & Zlate (2014) separately estimated their model for the pre-crisis and post-crisis period in order to assess if there was any change on the determinants of net inflows and portfolio inflows for the major emerging economies. For net capital inflows, the authors do not find many differences between the two distinct periods as the main determinants are the growth and policy rate differentials; on the contrary, risk aversion only has a significant negative effect in the post-crisis period. Regarding portfolio inflows, the growth differential is not significant in both periods, while the policy rate and the VIX are significant in both periods: the former is positively related with portfolio inflows while the latter is negatively associated. Considering structural break tests for these dependent variables, the authors conclude for a structural change in the sensitivity of flows to policy rate differentials, especially for portfolio inflows.

3.5 The effect of unconventional monetary policies on capital flows - empirical results

Seven years after the GFC, the monetary tsunami continues to flood the world economy. Monetary accommodation remains critical to support the real economy and to encourage economic risk taking in AE, with the objective to increase real spending by households and to encourage businesses to invest and hire (IMF, 2014c).

Even if UMPs successfully stimulated economy, "(…) market and liquidity risks have increased to levels that could compromise financial stability if left unaddressed." (IMF, 2014c). This built up of risks can compromise financial stability and affect economic fundamentals. The available evidence seems to suggest that unconventional policies have increased the leverage of the corporate sector (IMF, 2014b). The effects of these actions on NAE could have been disguised by their fundamentals in the post-crisis period. In recent years, the cooling down of the fundamentals in NAE may have emerged the risks built up by the response of the major central banks of the AE.

When the major central banks started to implement UMPs, the literature reconsidered its main purpose and began to assess whether UMPs accelerated or not capital flows to NAE; in the presence of a positive answer, literature questioned if those policies impacted equally the components of the financial account. As presented in the previous sections, literature supports the hypothesis that UMP decreased interest rates in AE. It was argued that the decrease of short and long-term interest rates in AE induced capital to flow to countries with higher returns (IMF, 2013d). Additionally, it was argued that UMP created an excess of global liquidity which, together with low interest rates in AE and better growth prospects in NAE, pulled capital to flow to NAE by increasing investors' risk taking (IMF, 2014c).

Fratzscher *et al.* (2013) analyzed the global spillovers of Fed's UMP measures both in the US and other AE as well as in NAE. The objective of the study is to investigate the effects of the UMP measures on asset prices and on portfolio decisions, focusing on equity portfolio flows and on bond portfolio flows from January 2007 to December 2010. Regarding the way UMP is captured, two measures are used:

1) Dummies to capture the effects of the announcements related to Q1 and Q2 policies. As generally accepted in the literature regarding the announcements of the Fed, twelve episodes are taken into consideration.

2) The specific market interventions by the Fed are measured by the weekly changes of the amounts of the following operations: liquidity support measures for the financial sector, purchases of long term Treasury bonds, and purchases of long term mortgage backed securities and government-sponsored enterprise agency debts.

One of the major findings is that LSAP announcements had smaller effects on portfolio allocation than the effective implementation of the measures. Another finding is that US QE measures only explain a small portion of equity and bond portfolio flows between 2007 and 2010. However, UMP measures introduced an additional pro-cycle effect on portfolio flows to NAE.

Ahmed & Zlate (2014) assessed the primary drivers of private capital flows to NAE. Additionally, the work also seeks to raise a contribution on whether there has been a significant change on the behavior of capital flows after the GFC, comparing with the prior period, and whether UMPs triggered capital flows into NAE. Their work focuses on total and portfolio flows using a sample of seven Asian economies and five Latin American economies with quarterly data from 2002 to 2012. To capture the effects of UMPs, the authors use several measures: firstly, they use a dummy variable to assess if the capital flows to emerging markets reacted to the announcements of monetary actions; secondly, the 10-year US Treasury bond yield is used; finally, the net asset purchases are used to more directly capture the effect of UMP. The authors conclude, from the estimations they made, that the dummy variable for the announcements is not statistically significant for total net inflows, but is positive and statistically significant for portfolio net inflows. Regarding the statistical significance, the same result is obtained for the 10-year US Treasury bond yield, with the difference that the effect on portfolio flows is negative. Finally, the measure of LSAP is found to negatively influence portfolio inflows, even though it is not significant regarding total net inflows.

Contrarily to the previous studies, that focused on quantitative observed effects of monetary actions on capital flows, Lim *et al.* (2014) contributed to literature by

studying whether there are any additional unobserved effects of UMP after taking into account changes in the observable channels on gross capital inflows to developing countries since 2000Q1 until 2013Q2 with a sample of 60 emerging economies. The specification used on the paper does not include an explicit measure of quantitative easing due to the intention to capture UMPs' unobservable effects. For instance, the authors test the hypothesis that unconventional monetary actions operated through an unobserved channel by using a dummy variable for each QE round. The results are as follows: the transmission of the UMPs occurs through liquidity, portfolio rebalancing, and confidence channels. Additionally, heterogeneous effects were found regarding the way the components of the financial account reacted to quantitative easing – captured by the dummy variable. The results support the idea that portfolio flows are the component that was most affected by those policies with FDI remaining largely insensitive to QE-related channels.

Burns *et al.* (2014) followed the preceding work and studied the pattern of capital flows to NAE and the effects of UMP on those flows. The sample covers 60 developing countries from 2000:Q1 to 2013:Q2 and assesses the hypothesis that non-conventional monetary actions affected capital flows to emerging and developing economies through unobserved channels beyond the known monetary transmission mechanisms. Given so, quantitative measures of QE actions are not used. Instead, the authors use dummy variables to capture whether the extraordinary monetary measures have had an unusual effect on capital flows; these dummies are expected to capture the possibility that UMPs operated through unobservable channels. For robustness check, the authors present a continuous QE intervention measure based on the evolution of G4[12] central banks' balance sheet.

The study concludes that both push and pull factors appear to be relevant to explain the flow of capitals to emerging markets in post-crisis period. Additionally, the increase in capital flows registered after the 2009 is explained by the accommodative monetary policies followed by the G4 central banks, suggesting that capital flows were higher than they would be given the levels of other variables. Notwithstanding, there is

[12] Fed, ECB, BoE and BoJ constitute the G4 group.

evidence that the impact on capital flows diminishes with the successive episodes of quantitative easing.

Differently from the previous studies, Ree & Choi (2014) investigate how Korea's capital flows reacted to UMPs. The focus on Korea is explained by the fact that Korea is in border line between AE and EME and capital flows to this economy may somehow follow a safe haven behavior: in risk aversion moments, agents may allocate their resources in Korea. The base model uses data from January 2008 until June 2013 and focuses on portfolio flows, both equity and bond, and banking flows.

The authors conclude that portfolio equity flows to Korea are negatively related with the VIX. Contrarily, partially confirming the safe haven behavior, portfolio bond flows are positively related with VIX until risk aversion reaches a threshold. Once the threshold is breached, flows tend to react negatively to increases of risk aversion. Regarding the observable effect of UMP's operations or monetary policy announcements, neither equity portfolio nor bond portfolios were found to have been significant directly affected by these variables. The only component affected by UMP was cross-border banking capital flows, essentially through the mortgage-backed securities purchase program. However, the authors present the idea that UMP actions influenced capital flows indirectly through a negative effect on the VIX and on global liquidity.

Overall, literature tends to agree that UMP acted as an additional determinant of capital inflows to NAE. This conclusion holds for different specifications of the UMP, as well as for different measures of capital inflows.

3.6 Monetary policy normalization

Understanding if UMPs pushed capital flows to certain economies will allow us to understand which are the economies that may be more vulnerable to the effects of the normalization of the monetary policy and the potential occurrence of sudden stops.[13] For instance, the reversal of UMP may prompt several problems in those economies with weaker fundamentals and external imbalances by increasing borrowing costs and making the financing of fiscal deficits more difficult (World Bank, 2012). One first event that could provide some indications as to what might happen when the normalization of monetary policy begins is the announcement, in May 2013, of the possibility of Fed's intention to gradually reduce their large scale asset purchase program.

In the final days of May 2013, Fed's chairman Ben Bernanke raised the possibility of slowing down the pace of monthly acquisition of securities purchases from the prevailing $85 billion monthly rate to a lower quantity anticipating a complete phasing out (Bernanke, 2013). While this type of policies was not predicted by investors to last during a long period of time, the raise of the possibility of UMPs' unwind surprised markets (Mishra, Moriyaman, N'Diaye, & Nguyen, 2014). The market reaction to the announcement was sharp and understood by literature as surprisingly large. However, the impact was heterogeneous among emerging economies (Eichengreen & Gupta, 2014). Asset prices and currencies decreased, raising questions about NAE's growth prospects in an environment of uncertainty (IMF, 2014e).

This reaction to tapering talk was analyzed by the literature. The main objective was to understand which economies were affected and what drove capital flows in the period following the announcement, so a light could be raised towards understanding the possible effects of monetary policy normalization when the accommodative strategy was to be removed by monetary authorities. Eichengreen & Gupta (2014) analyze which countries were hit and why, focusing on the change in the exchange rate, foreign reserves and equity prices between April 2013 and August 2013. The authors conclude

[13] For a detailed discussion on the transition from the unconventional monetary policy to a less accommodative monetary policy stance, one can see IMF (2014b), IMF (2014c), and IMF (2015).

there is no evidence that countries with stronger fundamentals experienced smaller falls in exchange rates, foreign reserves, and stock prices. The key factor was the size of financial markets: countries with deeper markets experienced larger adjustments. The possible explanation provided by the authors is that investors concentrated their actions in large and liquid financial markets where they could rebalance their portfolios, contrasting with small and illiquid markets where portfolio rebalancing was limited. Additionally, the authors found that countries that allowed the exchange rate to appreciate and that experienced greater current account deficits in the post-crisis period to experience the sharpest exchange rate depreciation, reserve losses, and stock market declines after the tapering talk.

Aizenman, Binici, & Hutchison (2014) assess a similar question of the previous work by focusing on the immediate impact of tapering talk on three asset prices: stock market, exchange rate, and CDS spreads. To do so, the authors use daily data from November 27, 2012, until October 3, 2013. The study is conducted for 26 emerging countries. When the estimation takes into account the full sample, Bernanke's news are found to be associated with falls in stock prices and exchange rate depreciations, but show no significant impact on sovereign spreads, indicating the expectation of a retrenchment of capital flows and carry-trade to emerging markets. When the authors take into account the fundamental position of the different economies in the sample, dividing the sample between robust and fragile economies, the results reveal asymmetric adjustments: both groups experienced exchange rate depreciations by the time of Bernanke's tapering announcements, with this depreciation being more than three times larger for the robust group comparing with the fragile group. Furthermore, the tapering talking increased substantially CDS spreads for countries with robust fundamentals while having negligible effects in countries with weaker fundamentals. Additionally, the stock price reacted negatively to the announcements. However, even though the sign is equal for both groups, the reduction is more than two times larger for the countries belonging to the robust group.

To sum up, the results of Aizenman *et al.* (2014) imply that Bernanke's announcement hit the group of economies with stronger fundamentals more severely.

The authors provide a possible explanation for the results: countries with stronger economies may be the ones that received higher capital flows in the earlier period of quantitative easing, which, in times of retrenchment of those flows, could imply that they these are the ones experiencing higher adjustments.

However, there is some literature that provides empirical results that point in the opposite direction the previous works point. Mishra *et al.* (2014) analyze the market reaction around the dates of FOMC announcements from January, 1, 2013, to January, 22, 2014 and explore the factors that might have influenced those reactions. The model presented controls for macroeconomic fundamentals, such as the current account balance, the fiscal balance, inflation, financial depth, trade linkages with China, capital flows measures, and macro prudential policies.

The results are challenging in the sense they oppose the findings of Eichengreen & Gupta (2014) and Aizenman *et al.* (2014): market pressures are found to be reduced impact on countries with stronger fundamentals, deeper financial markets, better growth prospects, and a greater degree of financial integration. Countries with stronger fundamentals experienced lower pressure around each negative event.

Additionally, IMF (2014e), in line with the findings of Mishra *et al.* (2014), also found evidence that countries with stronger fundamentals and deeper financial markets subdued market pressures during the period between May and August 2013. In particular, current account and fiscal surpluses, lower inflation, higher GDP growth, and more reserves were associated with lower exchange rate depreciation, reductions in asset prices, and lower increases in bond yields.

Ahmed, Coulibaly, & Zlate (2015) assess "the importance of economic fundamentals in the transmission of international shocks to financial markets in various emerging markets (…)" particularly during the period of tapering talk. Consistent with the findings of Mishra *et al.* (2014) and IMF (2014e), they found emerging economies with better fundamentals to experience a smoother deterioration in exchange rates and increases in bond yields.

3.7 How should capital flows be measured?

During the 1990s net capital inflows mirrored gross capital inflows very closely. For this reason, gross capital flows could, generally, be ignored in earlier studies (Forbes & Warnock, 2011). As the size and volatility of gross capital flows expanded, the relation between net capital inflows and gross capital flows began to be disturbed because net capital flows remained somehow stable (Forbes & Warnock, 2011).

When deciding which of them should be the object of study, the question under investigation should be kept in mind. Net capital flows are the counterpart of the current account. If the economy is absorbing excessive net inflows, that might be an indicator of persistent current account deficits (De Gregorio, 2013). It could be said that that current account is what matters when focusing on the exchange rate, in particular real exchange rate. If the question under scrutiny is related with financial stability and the way EME's financial system are able to manage flows, gross capital flows are the ones which must be taken into account (Ahmed & Zlate, 2014).

Beyond the most used measures of capital flows, Janus & Riera-Crichton (2013) and Janus & Riera-Crichton (2014) proposed a four-way decomposition in order to answer to the fact that a considerable percentage of Balance of Payments changes on assets (liabilities) are actually negative (positive). The starting point for the decomposition is the balance of payments identity:

$$\text{Net Capital Inflow} = \text{Gross Capital Inflow} - \text{Gross Capital outflow} \Leftrightarrow$$
$$\Leftrightarrow \text{Net Capital Inflow} = \Delta\text{Stock of Liabilities} - \Delta\text{Stock of Assets}$$

As emphasised by Janus & Riera-Crichton (2013), both the variation of the stock of liabilities and of the stock of assets could actually register positive and negative values. This way, it is possible to re-write the equation:

$$\text{Net Capital Inflow} = \Delta\text{Stock of Liabilities} - \Delta\text{Stock of Assets} \Leftrightarrow$$
$$\Leftrightarrow \text{Net Capital Inflow} = (\text{L}^{+} - \text{L}^{-}) - (\text{A}^{+} - \text{A}^{-})$$

L^+ represents positive liability changes resulting from foreign investment in the economy;

L^- represents the absolute value of negative liability changes resulting from foreign disinvestment in the economy, i.e., an outflow from the economy;

A^+ represents positive asset changes resulting from domestic investment in foreign economies;

A^- represents the absolute value of negative asset resulting from domestic disinvestment in foreign economies, i.e., an inflow to the economy;

The objective of this decomposition is to distinguish the investment and disinvestment components that gross capital inflow and gross capital outflow fail to. Exemplifying, consider a hypothetical scenario where the stock of assets due to FDI decreased by \$1000. At the same time, portfolio investment on foreign economies increased by \$500 and other investment assets increased as well by \$500. Traditionally, the standard decomposition of capital outflows would record $\Delta A = 0$. However, following the four-way decomposition, we should record $\Delta A^+ = 1000$ and $\Delta A^- = 1000$.

Regarding the effectiveness of the four-way decomposition, Janus & Riera-Crichton (2013) concluded that it is possible to improve the prediction of sudden stop crises if literature would change its focus from the two way decomposition to the four-way one. Additionally, Janus & Riera-Crichton (2014), based on the previous decomposition, focus on capital reversals and its effects on output. The authors' findings suggest that gross foreign investment reversals have a negative output effect allowing them to conclude "(…) that the composition of the current account and not just its level or rate of change, can have a first-order output effect.". The authors also argue that these results could change the understanding of the literature regarding capital controls, as the more adverse output effect of reversals on the disinvestment component of liabilities, L^-, during financial crisis comparing with domestic outflows, via A^+, should push capital controls to limit the former but not the latter. Additionally, if the repatriation of capital, A^-, is found to have stronger effects on the output than foreign inflows, L^+, as

national investors tend to be better informed than foreign investors policymakers could have incentive to stimulate the former but not the latter.

4. Modeling capital flows

4.1 Common determinants of capital flows

We model capital flows following the literature reviewed on the previous chapter, as our purpose is not to present a new model to assess the determinants of capital flows. Contrariwise, our objective is to raise an econometric model that follows the general trend in the literature regarding the drivers of capital flows so we are able to analyze the questions we proposed to regarding the determinants of capital flows and whether there was a change on the determinants of the capital flows from the pre to the post-crisis. On the basis of that model, we will extend the benchmark model and introduce the UMP variables and the four-way decomposition.

Regarding the global conditions, it is usual to include a GDP growth differential between the domestic economy and the US (see e.g. Burns *et al.*, 2014) or, an aggregate of AE, such as the G4 (see e.g. Ahmed & Zlate (2014) and Nier *et al*., 2014). When a group of economies is considered, it is widely accepted to weigh the growth rates by GDP.

In order to capture Mundel-Flemings' capital mobility effect due to differences in interest rates, the interest rate differential is used in the literature, in which, apart from the country, or group of countries, with which the differential is built, different possibilities regarding the maturity of the interest rate used should be taken into consideration. Even though the literature usually focuses on U.S. monetary policies and consequently on US interest rates as proxy of global interest rates (Ahmed & Zlate, 2014) it is possible to compute an aggregate interest rate (Nier *et al.* , 2014).

Additionally, the literature considers measures of global risk aversion (see e.g. Ahmed & Zlate, 2014, and Nier *et al*., 2014), inflation, as in Fostel & Kaminsky (2008), and global money supply – Cerutti *et al.* (2014) and Burns *et al.* (2014). While not recurrent, there is also some literature which takes in account the yield curve of a country, or a group of countries, and the global growth expectation, measured by the Purchasing Managers' Index.

It seems to be generally accepted to include trade openness as an explanatory variable, as argued by Montiel (2014) and exemplified by Mercado & Park (2011) and

Okada (2013). Measures of institutional quality are also common, differing on the index used – usually the choice lays in the index constructed by Kaufman & Mastruzzi (2004) and used by Mercado & Park (2011) and Faria & Mauro (2009).[14]

As described in chapter 2, the study of how monetary actions in the post-crisis affected capital flows depends on what effect the researcher wants to capture. The literature provides three different options:

i) Capturing qualitative effects of specific events through the use of dummy variables. We can distinguish two different options: the use of dummy variables in order to capture the effect of monetary announcements (see e.g. Ahmed & Zlate (2014) or Fratzscher *et al.* (2013)) or the effective implementation of those announcements (e.g. Burns *et al.* (2014) or Lim *et al.* (2014));

ii) Controlling for the well-accepted channels by which monetary policy works literature presents the possibility of using a dummy variable to test the hypothesis UMP affected capital flows through unobserved channels beyond the usual transmission mechanisms (see e.g. Burns *et al.* (2014) or Lim *et al.* (2014)); and

iii) Assessing the quantitative effects of UMP on capital flows whether of a specific policy, such as the net asset purchases by the Federal Reserve (Ahmed & Zlate, 2014), the weekly changes of liquidity support measures or the purchases of long-term assets by the Federal Reserve (Fratzscher *et al.,* 2013), or a more broader quantitative measure, as the continuous expansion in the size of the central banks' balance sheet (Burns *et al.,* 2014), which reflects the direction and the intensity of the monetary policy.

[14] There are, however, other possible choices as the Freedom House (Noorbakhsh *et al.*, 2001), the International Country Risk Guide (ICRG), as proved by Papaioannou (2009), Alfaro *et al.* (2007), and Alfaro *et al.* (2008), or the Business Environmental Risk Intelligence (BERI) which was used by Globerman & Shapiro (2002).

4.2 Baseline model and methodological considerations

We use a panel data with the following specification:

$$CF_{it} = \propto + \beta_1 X_{it} + \beta_2 VIX_t + \gamma UMP_t + \mu_i + \nu_{it}.$$

CF_{it} represents the capital flows to country i in the quarter t – whether on its net, gross or four-way form- expressed as a percentage of GDP. X_{it} is the set of time variant and cross-country variables, VIX_t represents the only time-variant variable that is common to all the economies, and UMP_t represents the variables that try to capture unconventional monetary measures. α, β_1, β_2, and γ are the parameters to be estimated, μ_i represents the unobservable country-specific effect, and ν_{it} is the error term. We estimate the model including seasonal dummies. A more extensive analysis of this specification will be conducted in the following paragraphs.[15]

In the literature, many paths were taken regarding model estimation. Before we opt for one, we will present the several options. Even if the literature on capital flows seems to generally agree on the use of panel data fixed effects in order to capture the unobserved heterogeneity among countries by takin into account all time-invariant country specific factors (e.g. see Fratzscher *et al*., 2013, Ahmed & Zlate, 2014, Burns *et al*., 2014, and Lim *et al.*, 2014). Nier *et al.* (2014) discuss the pertinence of using random effects as produces proper estimates regarding variables that do not vary significantly through time and differences are due mainly from cross-country differences. Ahmed & Zlate (2014) argue that fixed effects could be properly employed when the previous differences are constant over time but differ from country to country as this model is adequate to capture long-term factors.

Besides the discussion between fixed and random effects, which constitute the most common choices, other articles present distinct choices: i) Förster *et al*. (2014) use a dynamic hierarchical factor model as their objective is to estimate the pyramid structure that affects capital flows; ii) Fratzscher (2012) use a factor model; finally iii) Carlson &

[15] A brief description of each variable and where the data was retrieved from is provided in table A1 on the annex.

Hernandéz (2002) employ a seemingly unrelated regression technique, and iv) Ree & Choi (2014) estimate the panel data model by pooled OLS.

We carry out the Hausman test for the benchmark model regarding NAE and AE in order to test which would be the most appropriate model to employ between fixed and random effects.

Table 1 – Hausman test for non-advanced economies

Dependent variable:	*Net inflows*	*Gross inflows*
Sample:	*Non advanced economies*	*Non advanced economies*
Period:	*2005Q1-2014Q4*	*2005Q1-2014Q4*
Equation:	*(1)*	*(2)*
Chi-Sq. Statistic	23.7795	38.4529
Prob.	0.0002	0.0000

Note: Dependent variable in % of GDP.

Table 2 – Hausman test for advanced economies

Dependent variable:	*Net inflows*	*Gross inflows*
Sample:	*Advanced economies*	*Advanced economies*
Period:	*2005Q1-2014Q4*	*2005Q1-2014Q4*
Equation:	*(3)*	*(4)*
Chi-Sq. Statistic	10.7243	12.4566
Prob.	0.0571	0.0290

Note: Dependent variable in % of GDP.

The results support the rejection of the null hypothesis, i.e., the use of fixed effects over random effects. This is also the most common choice in the literature as pointed anteriorly. Consequently, we will test our model using cross-section fixed effects. Nonetheless, we will, on section 5.6, discuss how the results would change if we would have opted for random effects.

CF_{it} represent the different measures of capital inflows:

- **Capital flows**

Net capital flows are defined as the difference between gross capital flows – the variation of the stock of liabilities registered in a certain period - and gross capital outflows – the variation of the stock of assets registered in a certain period. These variables are well-known and attract the majority of the attention from literature. Additionally, we will use the four-way decomposition in order to measure capital flows as discussed in section 3.7.

All of these capital flows are measured relative to the GDP in US dollars. Because GDP is only available seasonally adjusted for 17 economies, the majority of the advanced ones, we should take in consideration possible seasonal effects. This is the reason why we include seasonal dummies in order to account for this effect.

X_{it} and Z_t represent the set of determinants likely to influence capital flows:

- **Growth differential**

This variable intends to capture the difference in growth prospects and possible cyclical differences between the real GDP growth in the *i* economy and the weighted average of the G4 economies: United States, Euro Area, Japan and United Kingdom. Similarly to the nominal GDP used to calculate the dependent variable, only the AE have seasonally adjusted data. Given so, we will avoid possible seasonal effects by calculating the real GDP growth over the homologous period.

- **Interest rate differential**

The interest rate differential aims to capture the possible effect regarding the difference of returns in agents' decisions of rebalance their portfolios. For instance, when central banks from AE ease their monetary policies it is expected that their interest rates decline and that induces agents to rebalance their portfolio favoring assets with higher returns giving the same level of risk.

From this point of view, we should use a measure that proxies, given countries' differences regarding the financial system, a short-term indicator of investors'

possibility of investment and it is homogeneous across all the countries in the sample. This is the usual option in the literature, as exemplified by Fratzscher (2012), Nier *et al.* (2014), and Burns *et al*. (2014). Given these aspects we use a 3-month money market interest rate that represents banks' marginal cost of funding (Coeuré, 2012). We build the G4 variable weighting the average of the G4's interest rates with GDP.

- **VIX**

In line with the existing literature, the VIX is used as a measure of global risk aversion.[16] Theoretically, agent's decisions are influenced by swings in investment sentiment. In periods of higher risk aversion agents tend to rebalance their portfolios towards safer and more liquid assets (Jevčák, Setzer & Suardi, 2010); the VIX measures the implied volatility of the Standard & Poor's (S&P) 500 index options. We will follow Nier *et al.* (2014) and compute the log of the VIX.

- **Trade Openness**

The variable is constructed summing the imports and the exports of a country and dividing it by the GDP in US dollars. This variable follows Alfaro *et al*. (2008), Mercado & Park (2011), and Okada (2013).

- **Institutional Quality**

We proxy institutional quality using the index constructed by Kauffman *et al.* (2004), such as Faria & Mauro (2009) did. This index reflects six dimensions of governance: voice and accountability, political stability and absence of violence, government effectiveness, regulatory quality, rule of law, and control of corruption.

UMPs are intended to be captured by variables included in UMP_t:

[16] There are, however, other alternatives as the Credit Suisse's Global Risk Appetite Index (Ahmed & Zlate, 2014), the VXD and the VXN (Abutaleb & Hamad, 2012 and Wong & Fong, 2013).

- **Announcements from monetary authorities:**

As Fratzscher (2013) and Ahmed & Zlate (2014), we also intend to capture the possible effect of announcements of UMPs on capital flows. Because our study includes more than one central bank, contrarily to the previous works, we will follow Lim *et al.* (2014) and Burns *et al*. (2014) and their episode indicator in the sense that we will define the dummy variable as taking the value of one if there are two or more monetary announcements from the G4 central banks in the quarter and zero if that does not occur. We should note however that the episode indicator from Lim *et al.* (2014) and Burns *et al.* (2014) is related with the effective implementation of QE policies rather than its announcement, as it is our intention.

Our announcements follow the work of Fawley & Neely (2013) that we expand beyond 2012.[17] To do so, we followed authors' rational and categorized monetary authorities' announcements as related with UMPs if the action increased the central bank liabilities. To do so, we reviewed the monetary policy announcements of each of the four central banks.

- **Balance sheet expansion:**

As argued in section 3.2, we will quantitatively measure the different monetary policies by the expansion of the balance sheet of the G4 central banks. Based on Burns *et al.* (2014) and Lim *et al.* (2014) we will construct our variable by weighting the quarterly balance sheet variation of G4 central banks by the GDP.

[17] The list of announcements could be consulted in table A2 to A5.

4.3 Data

We use quarterly data on direct investment, portfolio investment and other investment from January of 2005 to December of 2014, available in the IMF's database Balance of Payment Statistics, for 54 economies.[18] This period correspond to the full period available regarding the most recent Balance of Payments Manual, the 6th. From the same database we obtain nominal GDP. International Financial Statistics, on its turn, provides us data of real GDP, exchange rates, and import and export of goods and services. Additionally, the VIX was obtained from the Chicago Board Options Exchange (CBOE). The measure of institutional quality was obtained from the World Governance Indicators' database which is produced by Daniel Kaufmann, Aart Kraay and Massimo Mastruzzi. Finally, data regarding central banks' balance sheet is collected from each of the central banks' databases.

Regarding the sample of countries and given that our aim is to study the determinants of capital flows both to AE and NAE, we will follow Fratzscher *et al*. (2013).[19] For instance, regarding emerging economies the sample contains the most representative countries for each region that has been focusing by policy-making literature – Latin America, Asia, Emerging Europe, Middle East and Africa - as discussed in chapter 2. Additionally, because Fratzscher *et al*. (2013) is the only study that assesses similar questions to ours using AE follow this sample as a benchmark allows us to incorporate AE.

However, given data restriction regarding the explained variable it is not possible to follow completely the original sample. Kazakhstan, Kuwait, Nigeria, Pakistan, Saudi Arabia, Taiwan and Venezuela are dropped off the sample because of data restriction. Additionally, statistical analysis was employed to identify the countries that consistently stood out from the other countries in a cross section way.[20] Because the experience of

[18] The countries included in the sample are listed in table A6.

[19] Studies about capital flows focus mainly on emerging and developing economies. There is, however, some literature that groups in the same sample AE and NAE as Choi, Sharma & Strömqvist, Reinhart & Reinhart (2008), Milesi-Ferretti & Tille (2011), or Fratzscher (2012). Generally, when that is the option, the results are presented in the three ways: for all the economies, for the advanced, and for the non-advanced economies.

[20] An observation was considered an outlier if it outside the range determined by the average for quarter *t* plus (minus) three times the standard deviation of the observations in that quarter.

the countries regarding the behaviors of the variables may differ with the classification of the country between advanced and non-advanced group of economies, this statistical analysis was carried out taking that in consideration by employing the analysis after the sample was divided between AE and NAE. From this analysis Ireland, Hong Kong, and Singapore appear as outliers regarding the dependent variables.

Regarding Ireland, there is not any work other than Fratzscher *et al.* (2013) that is close to ours and considers AE. Even though, we should note that Milesi-Ferretti & Tille (2011), on their study about the drivers of capital flows during the collapse phase (2008:Q4 – 2009:Q1) and the recovery stage (2009:Q2 - 2009:Q4), excluded Ireland as it registered extreme values given reflecting the country's role as international financial intermediaries. This decision is in line with the results of our analysis. Consequently, we will remove the country from our sample. Regarding the removal of Hong Kong and Singapore, Ahmed & Zlate (2014), Burns *et al*. (2014), and Lim *et al.* (2014) do not take those countries in consideration. Additionally, Milesi-Ferretti & Tille (2011) do not take them as well into consideration given its extreme values. These countries are part of the set of international financial centers, reason why their capital inflows are extreme comparing with the rest of the sample. This way, we will drop them from our sample.

5. Estimation results

5.1 Benchmark model

Through the estimation of the benchmark model we intend to assess the determinants of capital flows during the period from 2005Q1 to 2014Q4. Additionally, these estimations allow us to evaluate the performance of the benchmark model in our sample by comparing the results with the literature. Finally, the results will allow us to establish a base model from which we will extend to the UMP variables and to the four-way decomposition.

Table 3 presents us results for NAE. Both measures of capital flows are negatively related with the VIX, which confirms the hypothesis that agents tend to reduce their exposure to NAE in periods of higher risk aversion. Additionally, the growth of real GDP is positively related with both net and gross capital inflows, suggesting that agents tend to balance their portfolios towards NAE with higher growth. Moreover, trade openness is found to have a negative effect on capital flows which supports the hypothesis that external agents evaluate trade openness as a possible transmission channel of financial crises, decreasing the investment decisions to economies with higher degree of trade linkages (Förster *et al*., 2012).[21] Finally, the result shows that institutional quality affects positively capital flows.

These results are in line with those presented by Ahmed & Zlate (2014) and Burns *et al*. (2014) that conclude that generally both push and pull factors are important determinants of capital flows to emerging economies – the VIX, the growth differential and institutional quality seem to be the variables that are consistently significant in explaining capital inflows to NAE; contrarily, the interest rate differential is not significant regarding capital inflows

[21] For further discussion on how currency crises propagate through the trade channel see Glick & Rose (1999), Haile & Pozo (2008) and Haidar (2012) for example.

Table 3 - Benchmark results for non-advanced economies

Dependent variable:	*Net inflows*	*Gross inflows*
Model:	*Fixed effects*	*Fixed effects*
Sample:	*Non advanced economies*	*Non advanced economies*
Period:	*2005Q1-2014Q4*	*2005Q1-2014Q4*
Equation:	*(5)*	*(6)*
VIX	-0.0243 (0.0076)***	-0.0591 (0.0162)***
Growth differential	0.6268 (0.0882)***	0.9139 (0.1281)***
Interest rate differential	-0.0048 (0.0688)	0.5621 (0.4066)
Trade openness	-0.1599 (0.0273)***	-0.1911 (0.0459)***
Institutional quality	0.0743 (0.0302)**	0.1362 (0.0488)***
Seasonally controlled	Yes	Yes
Observations	867	867
R-squared	0.337	0.286

Note: White robust standard errors in parenthesis. Dependent variable in % of GDP. * significant at 10%, ** significant at 5%, *** significant at 1%.

At this point, we should try to understand how the results change if, as Fratzscher *et al*. (2013) did, we consider AE and NAE in the same sample. Following the results presented in table 4, for net capital inflows, only trade openness and institutional quality are significant with the same sign as previously discussed for NAE. Given the insignificance of both growth differential and the VIX comparing with the results previously presented for non-advanced results we are able to conclude that this is a signal that the model could fail to distinguish possible different experiences such as the advanced and non-advanced. Regarding gross capital flows the results are similar to the results presented in equation 6; the only difference lays on the insignificance of growth differential in equation 8 which was significant in equation 6.

Table 4 - Benchmark results for all the economies

Dependent variable:	*Net inflows*	*Gross inflows*
Model:	*Fixed effects*	*Fixed effects*
Sample:	*All the economies*	*All the economies*
Period:	*2005Q1-2014Q4*	*2005Q1-2014Q4*
Equation:	*(7)*	*(8)*
VIX	0.0031	-0.1108
	(0.0060)	(0.0178)***
Growth differential	0.0129	0.2330
	(0.0749)	(0.1756)
Interest rate differential	-0.0729	0.5271
	(0.0905)	(0.3596)
Trade openness	-0.0953	-0.2190
	(0.0246)***	(0.0578)***
Institutional quality	0.1133	0.2523
	(0.0244)***	(0.0638)***
Seasonal controlled	Yes	Yes
Observations	1605	1605
R-squared	0.298	0.151

Note: White robust standard errors in parenthesis. Dependent variable in % of GDP. * significant at 10%, ** significant at 5%, *** significant at 1%.

In order to understand how putting together economies with possible different experiences may affect the results, we present in table 5 the results of net and gross capital flows when considering only AE. For net capital inflows, market sentiment is significant with positive coefficient, which constitutes a striking difference with the results previously presented, both for non-advanced and for all the economies in the same sample. This result may suggest that AE are perceived as safe-haven currencies.[22] In other words, when the risk aversion decreases, investors tend to flow their capital to NAE, which reflects the higher perceived riskiness of those economies (Bluedorn *et al*., 2013). However, the coefficient of VIX changes when looking to gross inflows as it becomes negative. Bluedorn *et al*. (2013) argue that in periods of low risk aversion gross inflows increase less than gross outflows, suggesting that residents' investing abroad is higher than foreigners' investment inwards AE.

[22] The literature usually emphasizes Switzerland and Japan as the countries to which this status is assigned the most. One could read Botman, Filho, and Lam (2013), Habib & Stracca (2013), or Ranaldo & Söderlind (2010) for further discussion on this subject.

Additionally, net inflows are positively related with interest rate differential, which confirms the hypothesis that economies with higher interest rates capture higher levels of net inflows. Trade openness registers a significant and negative coefficient, even when looking at gross inflows, which may confirm the hypothesis that agents perceive trade linkages as a channel of propagation of financial crises, decreasing the volume of capital to economies with higher trade openness. Finally, institutional quality has a positive coefficient regarding net and gross inflows.

Table 5 - Benchmark results for advanced economies

Dependent variable:	*Net inflows*	*Gross inflows*
Model:	*Fixed effects*	*Fixed effects*
Sample:	*Advanced economies*	*Advanced economies*
Period:	*2005Q1-2014Q4*	*2005Q1-2014Q4*
Equation:	*(9)*	*(10)*
VIX	0.0298 (0.0099)***	-0.1585 (0.0321)***
Growth differential	-0.0441 (0.1690)	1.1330 (0.4650)**
Interest rate differential	0.6296 (0.2798)*	0.1395 (0.8990)
Trade openness	-0.0346 (0.0398)	-0.2830 (0.1658)*
Institutional quality	0.1005 (0.0430)**	0.2903 (0.1498)*
Seasonally controlled	Yes	Yes
Observations	719	719
R-squared	0.305	0.166

Note: White robust standard errors in parenthesis. Dependent variable in % of GDP. * significant at 10%, ** significant at 5%, *** significant at 1%.

Overall, from the results we can see that including in the same sample AE and NAE in the same regression causes the model to produce results that are not consistent with the results of the different groups when estimated separately. This effect is noticeable significant when comparing NAE's determinants of net capital inflows with the determinants of net capital inflows to all the economies. Moreover, we are able to conclude that VIX is a significant determinant of gross inflows both for NAE and AE.

Nonetheless, we should note that the VIX presented opposite signals regarding net inflows: the negative signal regarding NAE contrasts with the positive signal obtain for AE. Additionally, institutional quality was found to have a positive effect on capital inflows for the two groups, independently of the measure of the flows. Finally, growth differential is only relevant regarding inflows to NAE and gross inflows to AE.

5.2 Did the determinants of capital flows change from the pre-crisis period to the post-crisis period?

We will now study whether the determinants of capital flows in the pre-crisis period remained significant in the post-crisis period. By analyzing the pre and post-crisis periods separately we aim to identify potential differences regarding the determinants of capital flows in these two periods.[23] This analysis follows the work of Fratzscher (2012) and Ahmed & Zlate (2014) that assessed a similar question.

Before doing so, we need to define the pre-crisis and the post-crisis periods. We will follow the literature and define the bankruptcy of the Lehman Brothers in September 2008 as the episode that originated the GFC (e.g. Fawley & Neely, 2013). Therefore, we define the pre-crisis period from 2005Q1 until 2008Q3 and the post-crisis period from 2008Q4 until 20014Q4.

For NAE there is not a significant difference between the two periods regarding net inflows, as both growth differential and institutional quality are significant with a positive coefficient. As can be concluded from the results presented in equation 11 and 12, the only difference is related with trade openness which is not significant in the pre-crisis period but displays a statistically significant negative coefficient in the post-crisis period. The VIX, which was significant in the whole period, is not significant when the period is divided in the pre and post-crisis period. These results differ, in part, from those of Ahmed & Zlate (2014) who conclude for a structural change from pre-crisis to post-crisis period especially regarding the sensitivity of capital flows to policy rate differentials. We should note, however, that Ahmed & Zlate (2014) raised their conclusions based structural break tests. In a different way, our work is based on the estimation of the two sub-periods separately.

When we turn our attention to gross inflows we are able to conclude that there is no difference between the two periods: growth differential has a positive significant coefficient in the two distinct periods, while the interest rate differential is significant in

[23] The results regarding all the economies reveal the same problem that we discussed in the previous section. This way, even though we will not discuss the results, they may be consulted in tables A7 and A8.

the pre-crisis period but loses its significance in the post-crisis period. As in the case of net inflows, the VIX is not significant in each of the sub-periods.

Table 6 - Pre and post-crisis regressions for non-advanced economies' net inflows

Dependent variable:	*Net inflows*	*Net inflows*
Model:	*Fixed effects*	*Fixed effects*
Sample:	*Non advanced economies*	*Non advanced economies*
Period:	*2005Q1-2008Q3*	*2008Q4-2014Q4*
Equation:	*(11)*	*(12)*
VIX	0.0152	-0.0143
	(0.0117)	(0.0109)
Growth differential	0.5333	0.2253
	(0.1614)***	(0.1155)**
Interest rate differential	-0.0066	-0.1960
	(0.0492)	(0.2764)
Trade openness	-0.1019	-0.1097
	(0.0654)	(0.0349)***
Institutional quality	0.1458	0.1084
	(0.0807)*	(0.0548)**
Seasonally controlled	Yes	Yes
Observations	348	519
R-squared	0.563	0.301

Note: White robust standard errors in parenthesis. Dependent variable in % of GDP. * significant at 10%, ** significant at 5%, *** significant at 1%.

If we shift our attention from NAE to AE we can see on table 8 that, regarding net capital inflows, the experiences in the pre and post-crisis period were different: in the former period VIX was the only significant variable with a positive coefficient suggesting the same effect obtained to the whole period. When looking to the post-crisis the VIX results holds again – which could be an indication that during times of high risk aversion advanced economies were viewed as safe-haven by agents; additionally, trade openness and institutional quality were also significant in the post-crisis period, but not on the pre-crisis, with a negative and a positive coefficient, respectively.

For gross inflows, the determinants do not differ when comparing the two sub-periods: the VIX is significantly negative in both sets; the only difference lies on the negative significance of trade openness in the pots-crisis period. However, it should be

said that the results differ when we compare them with those obtained for the full period as growth differential and institutional quality lose their explanatory value.

Table 7 – Pre and post-crisis regressions for non-advanced economies' gross inflows

Dependent variable:	*Gross inflows*	*Gross inflows*
Model:	*Fixed effects*	*Fixed effects*
Sample:	*Non-advanced economies*	*Non-advanced economies*
Period:	*2005Q1-2008Q3*	*2008Q4-2014Q4*
Equation:	*(13)*	*(14)*
VIX	-0.0006	-0.0251
	(0.0202)	(0.0185)
Growth differential	0.5395	0.2987
	(0.3265)*	(0.1619)*
Interest rate differential	0.6695	0.0701
	(0.3255)**	(0.5136)
Trade openness	0.0146	-0.0519
	(0.1047)	(0.0624)
Institutional quality	0.0205	0.1382
	(0.0972)	(0.1110)
Seasonally controlled	Yes	Yes
Observations	351	512
R-squared	0.609	0.16

Note: White robust standard errors in parenthesis. Dependent variable in % of GDP. * significant at 10%, ** significant at 5%, *** significant at 1%.

To sum up, our results differ from those of Ahmed & Zlate (2014) regarding NAE as we did not conclude for a change on the determinants of capital flows from one period to the other. In other words, the determinants of the capital flows in the pre-crisis period were generally found as the determinants of the capital flows in the post-crisis period. In addition, we also conclude for the inexistence of a change on the determinants of capital flows for the experience of AE' gross inflows. AE' net inflows appear as the only variable which registers a significant change on its determinants between the two periods.

Finally, we should note that the when dividing the sample on the two periods, some results reveal less statistically significant variables that the equivalent equations on table

3 and 5. We suspect that this happens given the fewer number of observations taking into account by the model.

Table 8 – Pre and post-crisis regressions for advanced economies' net inflows

Dependent variable:	*Net inflows*	*Net inflows*
Model:	*Fixed effects*	*Fixed effects*
Sample:	*Advanced economies*	*Advanced economies*
Period:	*2005Q1-2008Q3*	*2008Q4-2014Q4*
Equation:	*(15)*	*(16)*
VIX	0.0365	0.0404
	(0.0139)***	(0.0150)***
Growth differential	-0.2023	-0.1497
	(0.2788)	(0.2405)
Interest rate differential	0.2103	-0.2946
	(0.4448)	(0.7641)
Trade openness	-0.0140	-0.1514
	(0.0374)	(0.0730)**
Institutional quality	0.0144	0.2934
	(0.0657)	(0.0902)***
Seasonally controlled	Yes	Yes
Observations	300	419
R-squared	0.62	0.282

Note: White robust standard errors in parenthesis. Dependent variable in % of GDP. * significant at 10%, ** significant at 5%, *** significant at 1%.

Table 9 – Pre and post-crisis regressions for advanced economies' gross inflows

Dependent variable:	*Gross inflows*	*Gross inflows*
Model:	*Fixed effects*	*Fixed effects*
Sample:	*Advanced economies*	*Advanced economies*
Period:	*2005Q1-2008Q3*	*2008Q4-2014Q4*
Equation:	*(17)*	*(18)*
VIX	-0.0959	-0.0516
	(0.0569)*	(0.0288)*
Growth differential	0.8208	0.0164
	(0.9932)	(0.4119)
Interest rate differential	-1.1156	0.5050
	(1.1838)	(0.9970)
Trade openness	0.1315	-0.0698
	(0.1522)	(0.0331)**
Institutional quality	0.0452	0.0303
	(0.2997)	(0.0248)
Seasonally controlled	Yes	Yes
Observations	300	419
R-squared	0.348	0.069

Note: White robust standard errors in parenthesis. Dependent variable in % of GDP. * significant at 10%, ** significant at 5%, *** significant at 1%.

5.3 Did unconventional monetary policies push capital flows to certain economies?

Until now we have analyzed the determinants of capital flows in the whole sample and in two distinctive sub-periods. We now introduce the variables aiming to capture the effects of UMP on capital flows.

The results presented in tables 10 to 13 are robust across both dependent variables and across the different groups of economies considered: the increase in G4 central banks' balance sheet is significant with the expected positive sign.

Table 10 – UMP effects on net inflows to non-advanced economies

Dependent variable:	*Net inflows*	*Net inflows*
Model:	*Fixed effects*	*Fixed effects*
Sample:	*Non-advanced economies*	*Non-advanced economies*
Period:	*2005Q1-2014Q4*	*2005Q1-2014Q4*
Equation:	*(19)*	*(20)*
VIX	-0.0208 (0.0083)**	-0.0165 (0.0086)*
Growth differential	0.6153 (0.0970)***	0.5801 (0.0892)***
Interest rate differential	-0.0131 (0.0744)	0.0006 (0.0685)
Trade openness	-0.1821 (0.0304)***	-0.1558 (0.0272)***
Institutional quality	0.0659 (0.0312)**	0.0780 (0.0301)***
UMP variables:		
G4 Central Banks Balance Sheet	4.5273 (1.5049)***	
UMP Announcements		-0.0129 (0.0049)***
Seasonally controlled	Yes	Yes
Observations	764	867
R-squared	0.344	0.342

Note: White robust standard errors in parenthesis. Dependent variable in % of GDP. * significant at 10%, ** significant at 5%, *** significant at 1%.

Table 11 – UMP effects on gross inflows to non-advanced economies

Dependent variable:	*Gross inflows*	*Gross inflows*
Model:	*Fixed effects*	*Fixed effects*
Sample:	*Non-advanced economies*	*Non-advanced economies*
Period:	*2005Q1-2014Q4*	*2005Q1-2014Q4*
Equation:	*(21)*	*(22)*
VIX	-0.0479 (0.0176)***	-0.0354 (0.0170)**
Growth differential	0.8669 (0.1404)***	0.8014 (0.1330)***
Interest rate differential	0.6077 (0.4090)	0.5710 (0.3899)
Trade openness	-0.2092 (0.0515)***	-0.1828 (0.0455)***
Institutional quality	0.1917 (0.0616)***	0.1443 (0.0490)***
UMP variables:		
G4 Central Banks Balance Sheet	10.8288 (2.7226)***	
UMP Announcements		-0.0348 (0.0090)***
Seasonally controlled	Yes	Yes
Observations	764	867
R-squared	0.297	0.299

Note: White robust standard errors in parenthesis. Dependent variable in % of GDP. * significant at 10%, ** significant at 5%, *** significant at 1%.

Focusing on the balance sheet variable, the results support the hypothesis that UMP pushed capital flows to NAE in the post-crisis period. This result is consistent for both net and gross inflows and points to the same direction of Fratzscher *et al.* (2013), Ahmed & Zlate (2014), Burns *et al.* (2014), and Lim *et al.* (2014). We should highlight that our result is important to literature as points in the direction of the previous studies using a different sample and a different measure of UMP.

However, our results bring to the discussion another finding: UMP did not only affect non-advanced markets as it also affected gross inflows to AE. The closest result produced before by the literature is the one of Fratzscher *et al.* (2013) that supports the idea that FED's liquidity operations induced equity portfolio inflows to AE as well the acquisition of mortgage-backed securities and government-sponsored enterprise debt

induced bond portfolio flows to the same economies. However, Fratzscher *et al.* (2013) conclude some UMP induced bond portfolios outflows from the AE, namely the acquisition of long term treasury bonds. This difference should take into consideration that our quantitative measure of UMP is broader since it includes four distinct central banks and, therefore, does not distinguishes individual countries' policies.

Table 12 – UMP effects on net inflows to advanced economies

Dependent variable:	*Net inflows*	*Net inflows*
Model:	*Fixed effects*	*Fixed effects*
Sample:	*Advanced economies*	*Advanced economies*
Period:	*2005Q1-2014Q4*	*2005Q1-2014Q4*
Equation:	*(23)*	*(24)*
VIX	0.0326	0.0331
	(0.0107)***	(0.0112)***
Growth differential	-0.0179	-0.0649
	(0.1777)	(0.1702)
Interest rate differential	0.3100	0.6248
	(0.2920)	(0.2804)**
Trade openness	-0.0700	-0.0338
	(0.0537)	(0.0397)
Institutional quality	0.1068	0.0982
	(0.0517)**	(0.0437)**
UMP variables:		
G4 Central Banks Balance	0.8586	
	(1.8423)	
UMP Announcements		-0.0048
		(0.0068)
Seasonally controlled	Yes	Yes
Observations	619	719
R-squared	0.276	0.305

Note: White robust standard errors in parenthesis. Dependent variable in % of GDP. * significant at 10%, ** significant at 5%, *** significant at 1%.

Additionally, it should be noted in table 14 and 15 that when the sample includes both AE and NAE, the conclusions do not change. Fratzscher *et al.* (2013) find, however, that the change in the amount outstanding of long term Treasury bonds related to the long scale asset purchase affected equity and bond inflows negatively when considering AE and NAE at the same time.

Table 13 – UMP effects on gross inflows to advanced economies

Dependent variable:	*Gross inflows*	*Gross inflows*
Model:	*Fixed effects*	*Fixed effects*
Sample:	*Advanced economies*	*Advanced economies*
Period:	*2005Q1-2014Q4*	*2005Q1-2014Q4*
Equation:	*(25)*	*(26)*
VIX	-0.0787 (0.0339)**	-0.1078 (0.0360)***
Growth differential	0.8363 (0.4932)*	0.8145 (0.4690)*
Interest rate differential	-0.2067 (1.0167)	0.0670 (0.8815)
Trade openness	-0.1304 (0.2157)	-0.2715 (0.1655)
Institutional quality	0.3270 (0.1742)*	0.2554 (0.1505)*
UMP variables:		
G4 Central Banks Balance Sheet	28.3866 (6.0245)***	
UMP Announcements		-0.0727 (0.0211)***
Seasonally controlled	Yes	Yes
Observations	764	867
R-squared	0.158	0.179

Note: White robust standard errors in parenthesis. Dependent variable in % of GDP. * significant at 10%, ** significant at 5%, *** significant at 1%.

The results of the announcement dummy variable point in the opposite direction as theory would suggest and are contrary to previous empirical studies: the coefficient is consistently significant with a negative sign which indicates that in quarters where at least two central banks announced a new monetary action that announcement induced a reduction in inflows across both to AE and NAE. These results do not support the hypothesis that UMP's announcements itself contributed to increase capital flows to NAE economies as argued by Ahmed & Zlate (2014). Additionally, Fratzscher *et al.* (2012) finds a mixed effect of the announcements on capital flows, depending on the receiving economy and on the type of flow focused: QE1 announcements were found to

have affected positively equity and bond inflows to AE and NAE, except for bond inflows to NAE.[24]

Table 14 – UMP effects on net inflows to all the economies

Dependent variable:	*Net inflows*	*Net inflows*
Model:	*Fixed effects*	*Fixed effects*
Sample:	*All the economies*	*All the economies*
Period:	*2005Q1-2014Q4*	*2005Q1-2014Q4*
Equation:	*(27)*	*(28)*
VIX	0.0074	0.0142
	(0.0066)	(0.0068)**
Growth differential	-0.0134	-0.0495
	(0.0763)	(0.0776)
Interest rate differential	-0.1074	-0.0600
	(0.1098)	(0.0865)
Trade openness	-0.1084	-0.0913
	(0.0284)***	(0.0244)***
Institutional quality	0.1156	0.1134
	(0.0275)***	(0.0242)***
UMP variables:		
G4 Central Banks Balance Sheet	3.9189	
	(1.2003)***	
UMP Announcements		-0.0171
		(0.0044)***
Seasonally controlled	Yes	Yes
Observations	1399	1605
R-squared	0.286	0.305

Note: White robust standard errors in parenthesis. Dependent variable in % of GDP. * significant at 10%, ** significant at 5%, *** significant at 1%.

[24] We examine further this result by modifying the specification of the announcement variable from assuming 1 if at least two central banks announced a new monetary action to assuming 1 if the Federal Reserve announced a new policy. This way we were able to investigate if the difference on the results are related with the inclusion of the announcements of the ECB, BoE, and BoJ when comparing with previous studies. The results presented in table A9 to A11 do not differ significantly as the only alteration is related with the significance of the dummy when the dependent variable is the net inflow which is now not significant. Gross inflows continue to be negatively related with the dummy variable.

Table 15 – UMP effects on gross inflows to all the economies

Dependent variable:	*Gross inflows*	*Gross inflows*
Model:	*Fixed effects*	*Fixed effects*
Sample:	*All the economies*	*All the economies*
Period:	*2005Q1-2014Q4*	*2005Q1-2014Q4*
Equation:	*(29)*	*(30)*
VIX	-0.0642 (0.0190)***	-0.0645 (0.0199)***
Growth differential	0.1140 (0.1829)	-0.0282 (0.1855)
Interest rate differential	0.5434 (0.3765)	0.5811 (0.3280)*
Trade openness	-0.1523 (0.0666)**	-0.2025 (0.0569)***
Institutional quality	0.3280 (0.0772)***	0.2525 (0.0627)***
UMP variables:		
G4 Central Banks Balance Sheet	20.1824 (3.1487)***	
UMP Announcements		-0.0715 (0.0115)***
Seasonally controlled	Yes	Yes
Observations	1399	1605
R-squared	0.151	0.171

Note: White robust standard errors in parenthesis. Dependent variable in % of GDP. * significant at 10%, ** significant at 5%, *** significant at 1%.

At this moment we should point that this variable's results are not consistent either with what economic theory would guide us to expect or with the empirical results presented by the previous studies referred to. However, some points should be made clear regarding these results. Firstly, it needs to be said that these differences on the results could possibly be the result of the dummy capturing effects that are not related with the announcement. This problem could be related with two different situations: the use of an inadequate interval around the announcement or the inadequacy of quantitative variables in measuring effects of UMP in capital flows.

Related with the first situation, Neely (2010) argues that event-based studies often use high frequency data to measure very short-term changes on the dependent variable after an announcement. In this way, the announcement would affect the variable if in a

short interval around the event the variance of the announcement shock is arbitrarily large compared with the variance of the shock to the variable under investigation (Rigobon & Sack, 2004). By using a short-term window around which the effects of the announcement are measured, such studies try to reduce the potential bias that rise from the announcing of other significant economic news during the period around which the event-study is carried out which potentially creates measurement error problems (Krishnamurthy & Vissing-Jorgensen, 2011). For instance, the event-study approach through the use of dummy variables during such a long period as a quarter may produce results that reflect more events beyond the one initially focused. Therefore, the interpretation of the results should be careful and reflect the potential bias that arises from the way that the announcement effect is being captured.

Regarding the discussion of the suitability of using qualitative variables as a measure of UMP effects, it must be said that the use of quantitative variables which try to capture the effect of unconventional monetary policies produce more reliable results as they capture the effect of a variable that does not suffer from those possible bias. For this reason, in section 5.5 we test the effectiveness of the balance sheet variable by using an alternative measure. The conclusions do not change which enhances our preference of using quantitative variables over qualitative in assessing the effects of UMP measures.

Given the limitations related with the use of qualitative variables discussed in the previous paragraphs, we will not use the dummy when considering the four-way decomposition as dependent variable as we recognize its limitations. We will, however, continue to use of the variable that captures the expansion of the balance sheet as we consider it the most adequate choice to capture the UMP effects on capital flows.

5.4 The four-way decomposition

At this point, we will employ our benchmark model constructed on the base of the literature reviewed to the four-way decomposition perspective of capital flows.[25]

Prior to describing our results we should note that from the four-way decomposition we will focus our attention on three components. On one hand, L^+ and L^- measure the variation of the stock of liabilities in a certain period. On the other hand, A^+ and A^- measure the variation of stock of assets. Recalling that our motivation in studying the recent experience of capital flows, and particularly the effect of UMP, is based on the possible macro-economic and financial stability effects that an overflow of capital flows could cause to the economies that receive them, we will focus on L^+ and L^-, as they account for the liability part of the balance of payments, as well as on A^- which in its essence is a capital inflow – every time national agents decrease their holdings of external assets they are inducing capital inflows.

We should highlight that we will focus only on NAE. This set of economies, after the GFC, account for 50% of the global capital inflows comparing with less than 20% in the six years before the event (IMF, 2014e). Together with significant growth and yield differentials (IMF, 2011b), UMP were argued to push capital inflows to NAE. As discussed in the previous section, our results support the hypothesis that UMP was significant in contributing for the increase of capital inflows received by the NAE relatively to total inflows. In many cases, "the inflows were accompanied by a rapid expansion of credit, fueling an overheating of domestic economies and setting the conditions for a buildup of vulnerabilities." (IMF, 2014e). Because the experience of the NAE group in the post-crisis period was more likely to contribute to the build-up of internal and external imbalances, we will apply the four-way decomposition to this set of economies.

On equation 31 and 34 we estimate the determinants of the investment decisions by foreign agents, L^+, in the whole sample regarding emerging markets. Growth differential is statistically significant with a positive coefficient, supporting the idea that foreign agents decide to invest on NAE with better growth prospects; on the contrary, it

[25] The results regarding advanced economies and all the economies are presented in table A12 to A15.

should be highlighted that risk aversion is not significant regarding those investment decisions. Additionally, we find UMP to act as an additional push factor of capital flows to NAE as the decisions of foreign agents in investing on those economies are positively related with the expansion of the G4 central banks' balance sheet. This result could be relevant, considering the result of Janus & Riera-Crichton (2014) which concluded for an important effect of gross foreign investment reversal on the output, effect that is particularly strong for emerging countries during sudden stops crises. For instance, as discussed in section 3.6, events of normalization of monetary easing, namely by the Federal Reserve, might expose several problems to those economies with weaker fundamentals and external imbalances by increasing borrowing costs and making the financing of fiscal deficits more difficult (World Bank, 2012). On the second and third quarter of 2013, episodes of normalization of monetary policy triggered pronounced adjustments in emerging and developing countries namely affecting national stock markets, exchange rates, and CDS spreads decreasing the incentives to carry-trade activities on those economies and increasing uncertainty (Aizenman, Binici, & Hutchison, 2014). The result could be possible external shocks in form of sudden stops (IMF, 2010a, IMF, 2011b and Powell, 2010) or the retrenchment of capital outflows (Aizenman, Binici, & Hutchison, 2014). If the external shock operates through the reversal of foreign investment, the effect on the output can be harmful, particularly during currency, current account and sudden stop crises as argued by Janus & Riera-Crichton (2014).

Continuing with the second element of capital inflows, L^{-}, equation 32 and 35 allow us to see that the VIX is significant in explaining L^{-}, suggesting market sentiment to be relevant for the reduction of foreign investors' exposure to certain foreign markets – in moments in which risk aversion is greater, foreign agents repatriate their funds to their domestic economy. Additionally, growth differential is found to have a significant influence L^{-}, as the decisions increase when the growth differential progresses in favor of the growth of the world economy. Finally, the results allow us to conclude that UMP is not found to exert any influence on this variable.

Finally, A^- has VIX as a significant explanatory variable with a positive coefficient, suggesting that national agents decrease their foreign exposure during periods of higher risk aversion. However, table 16 and 17 present results contrary to what we would expect theoretically as growth differential was found to be negatively associated with A^-; institutional quality is also found to be negatively associated with A^-. Additionally, the model gives us new insights regarding the A^- component: being a *de facto* capital inflow, this component was found to be negatively affected by monetary policy actions implemented in the course of the global financial crisis. This result could be particularly important if the hypothesis advanced by Janus & Riera-Crichton (2013) holds: because national agents are more well-informed and this type of inflow promotes growth more than asset bubbles, A^- should be encouraged over L^+. The results point that UMP pulled L^+ to NAE and pushed A^- from them, which could indicate that monetary actions from the G4 central banks overflowed economies with the most dangerous type of inflow, possibly contributing for asset bubbles and other macro-economic unbalances.

Employing our model to the four-way decomposition raised additional insights beyond the results and conclusions discussed on the previous sections. It should be highlighted that the determinants of the four-way decomposition differ with the component focused. Remembering that we previously found the VIX to be negatively related with net and gross inflows, decomposing those standard measures allows us to obtain additional understanding of how capital inflows react to changes in risk aversion. Our results support the idea that the decision of investing in NAE is not affected by risk aversion; contrarily, the decision of disinvesting follows positively changes on market sentiment - in other words, when the market sentiment moves towards higher risk aversion, foreign investors tend do decrease their exposure to NAE. Moreover, the importance of growth only seems to be important in explaining the decisions of investment in NAE – the positive relation between gross inflows and growth operates through the L^+ .

Table 16 – Benchmark results for the four-way elements regarding non-advanced economies

Dependent variable:	*L+*	*L-*	*A-*
Model:	*Fixed effects*	*Fixed effects*	*Fixed effects*
Sample:	*Non-advanced economies*	*Non-advanced economies*	*Non-advanced economies*
Period:	*2005Q1-2014Q14*	*2005Q1-2014Q14*	*2005Q1-2014Q14*
Equation:	*(31)*	*(32)*	*(33)*
VIX	-0.0153	0.0190	0.0228
	(0.0120)	(0.0035)***	(0.0043)***
Growth differential	0.2287	-0.0891	-0.2220
	(0.0655)***	(0.0372)**	(0.0431)***
Interest rate differential	0.5277	-0.0275	-0.0134
	(0.3629)	(0.0215)	(0.0374)
Trade openness	-0.0108	0.0076	0.0298
	(0.0277)	(0.0121)	(0.0170)*
Institutional quality	0.0573	-0.0006	-0.0542
	(0.0327)*	(0.0090)	(0.0149)***
Seasonally controlled	Yes	Yes	Yes
Observations	877	877	877
R-squared	0.412	0.218	0.299

Note: White robust standard errors in parenthesis. Dependent variable in % of GDP. * significant at 10%, ** significant at 5%, *** significant at 1%.

Table 17 – UMP results for the four-way elements regarding non-advanced economies

Dependent variable:	*L+*	*L-*	*A-*
Model:	*Fixed effects*	*Fixed effects*	*Fixed effects*
Sample:	*Non-advanced economies*	*Non-advanced economies*	*Non-advanced economies*
Period:	*2005Q1-2014Q14*	*2005Q1-2014Q14*	*2005Q1-2014Q14*
Equation:	*(34)*	*(35)*	*(36)*
VIX	-0.0084	0.0181	0.0190
	(0.0126	(0.0037)***	(0.0040)***
Growth differential	0.1998	0.0866	-0.2085
	(0.0745)***	(0.0369)**	(0.0428)***
Interest rate differential	0.5682	-0.0330	-0.0307
	(0.3572)	(0.0240)	(0.0384)
Trade openness	-0.0150	0.0035	0.0261
	(0.0299)	(0.0141)	(0.0190)
Institutional quality	0.1305	0.0022	0.0589
	(0.0465)***	(0.0104)	(0.0170)***
UMP variable:			
G4 Central Banks	5.9218	-0.9746	-3.2567
Balance Sheet	(1.8079)***	(0.6107)	(0.8788)***
Seasonally controlled	Yes	Yes	Yes
Observations	771	771	771
R-squared	0.412	0.234	0.342

Note: White robust standard errors in parenthesis. Dependent variable in % of GDP. * significant at 10%, ** significant at 5%, *** significant at 1%.

The literature has been pointing the influence of UMP on net and capital inflows to NAE. Our work provides new insights to the literature by concluding that UMP positively influenced the decisions of investment by foreign agents on NAE. This conclusion represents additional support to the apprehension of NAE's policy makers

regarding the pull effect of those monetary actions on capital inflows to NAE. Simultaneously, UMP exerted a negative effect on the repatriation of capital from domestic residents of NAE. It should be noted that Janus & Riera-Crichton (2013) introduced the hypothesis that even if L^+ and A^- are in fact capital inflows, they could have different effects on the output growth depending on the existence of asymmetric information between foreign and domestic investors.

5.5 Robustness checks

In the previous sections we discussed the results produced given the framework provided by the literature. However, we should assess how the results change if we drop some assumptions regarding our model.

We will start to evaluate the robustness of our results by modifying the specification of the UMP variable. Previously, we considered absolute changes in G4 central banks' balance sheet. One could argue that the effect of policies with impact on the balance sheet of those institutions could depend on the initial value of the balance sheet. In order to check whether our conclusions would change, we regress again our models with the UMP variable being specified as the aggregate percentage variation of G4 central banks' balance sheet. From table A16 to A19 we can see that the conclusions do not change with alternative specification, as the variable is highly significant.

Additionally, we employed the use of dummy variables in order to control for seasonal effects. At this point it is pertinent to question how the results would change if the main equations were estimated without controlling for the seasonal effects. As can be seen in table A20 to A29, the results previously presented and discussed do not change significantly: trade openness regarding gross inflows to AE loses its significance. Regarding the UMP model, the only differences are related with the increase of significance of the VIX regarding net inflows to NAE and the loss of significance of the growth differential and institutional quality regarding gross inflows to AE. Finally, the results of the four-way decomposition only change in the sense L^- is now negatively related with the UMP variable which enhances the conclusion that UMP pushed capital inflows to NAE. In other words, the results points in the direction that UMP decreased the decisions of foreign investors of disinvesting in NAE.

Finally, a strong assumption under fixed effects is that unobserved effects are related with the characteristics of each economy in the sample. However, if this assumption does not hold and the unobserved effects are not related with the observable variables, random effects model would be the most adequate model. The literature studying the determinants of capital flows tends to accept that fixed effects model is the most suitable model as discussed in section 4.2; nonetheless, it appears to be accepted to

estimate the model as well by random effects and present both the results (see e.g. Nier *et al*., 2014) in order to assess how the results change from one model to the other. As can be seen in table A30 to A39, the results do not change significantly: institutional quality is no longer significant regarding net and gross inflows to AE. Additionally, trade openness loses its significance regarding gross inflows to AE but is now negatively related with net inflows to these economies. Regarding the UMP model, the VIX and trade openness are no longer significant regarding net and gross inflows, respectively. When looking to the AE, institutional quality loses its significance and trade openness turns to be negatively associated with net inflows. Regarding gross inflows, growth differential and institutional quality are no longer significant. Finally, regarding the four-way decomposition, the only change is related with institutional quality: is no longer significant related with A^- but turns to be associated with L^-.

6. Conclusion

The global financial crisis presented itself as an enormous challenge regarding the monetary policy framework. Financial stress, negative output growth and deflationary pressures required central banks across the world to act firmly in order to counter act those risks. The monetary policy actions focused on short-term interest rate mechanisms in the early stages of the crisis, for as long as there was room to reduce short-term interest rates. However, as interest rates reached the zero lower bound, central banks implemented what has been denominated as unconventional monetary policies. These policies were argued to push capital inflows to NAE, contributing to the build-up of external imbalances.

Regarding the determinants of capital flows, our findings suggest that NAE have the same determinants for both net and gross inflows – interest rate differential is the only variable that is not significant. When looking to AE there is some difference between the two measures of capital inflows with the sign of the VIX being the most substantial – it has a positive coefficient when associated with net inflows; on the other hand has a negative coefficient regarding gross inflows. Additionally, growth differential is significant regarding gross inflows but not regarding net; contrarily, interest rate differential is significant regarding net inflows but not regarding gross. At this point we should note that including in the sample both AE and NAE produce results that do reflect neither the experience of the former nor the latter. This way, interpreting the results when the sample consists of economies with possible different experiences may be inaccurate.

Assessing at which extent it could be said that the determinants that explained capital flows in the pre-crisis period changed in the post-crisis period, our results point towards the direction that generally the same determinants in prior period were significant on the following.

It was concluded for both NAE and AE that gross inflows are negatively affected by the VIX. Further insight regarding the determinants of capital inflows is provided by estimating the three elements of the four-way decomposition, as this effect seems to work through L^- as this variable is positively related with risk aversion. For AE, this

effect offsets the negative effect of risk aversion on L^+. We should also note that A^+, which is a *de facto* inflow, has risk aversion as a significant variable with positive sign. Furthermore, the growth differential is relevant in explaining all the three components regarding NAE; regarding AE, the growth differential is only relevant for the component that accounts for the decisions of foreign agents in investing in those economies.

Finally, we addressed the hypothesis that UMP affected capital flows or not. Regarding the quantitative measure of those policies, the results were clear enough to let us conclude for a positive effect of UMP on net and gross capital inflows, independently of the group of economies. Nonetheless, we should highlight the problems that may emerge from the use of a qualitative variable in assessing the impact of monetary announcements on capital flows: by using dummy variables around long-term windows, potential bias could rise from the announcing of other significant news during the window around which the effects of the monetary announcement are measured. In this way, we argue that is more adequate to measure the UMP through quantitative variables that capture a particular effect rather than qualitative variables.

We contribute for the literature that already tested the effect of UMP on capital flows by extending this hypothesis to the elements of the four-way decomposition. UMP affected gross inflows through the investment decisions of foreign investors, L^+, but not through the disinvestment decisions of those agents, L^-. Additionally, the effect of those policies promoted a decrease of capital repatriation, A^-, from national agents. In other words, the inflows which caused apprehension in the resurge phase are those related with the increase of liabilities and not those related with the decrease of national agents' exposition to external assets. If domestic residents tend to be well-informed and their capital promotes output growth more than asset bubbles when comparing with foreign agents (Janus & Riera-Crichton, 2014), then unconventional monetary actions pushed to NAE the most dangerous component while pulled the component that contributes the most to output growth and financial stability. These results could be significant to policymakers in order to design and monitor effective capital controls as distinguishes the forms of inflows influenced by unconventional monetary actions.

To the best of our knowledge this is the first study that uses the four-way decomposition with the objective of assessing the determinants of capital flows through a different measure. If the literature evaluates that this decomposition raises additional understanding of the determinants of capital flows, it would be praised further study regarding this alternative measure of capital flows.

Finally, inasmuch the results regarding the four-way decomposition provided by this study address a very important question that affects policy-making worldwide it is not understood at present how the four elements affect variables as the credit growth, exchange rates, or asset prices. Before understanding those channels it could be inaccurate to extrapolate and extract policy-making conclusions regarding the effect of unconventional monetary policies on those variables based on the results we present. Our results only point in the direction that unconventional monetary policies affected the elements of the four-way decomposition. Further work will require assessing the effect of those variables on the robustness of the financial system and macroeconomic imbalances.

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Annex

Figures

Figure A1 - Capital Inflows to Emerging Asia

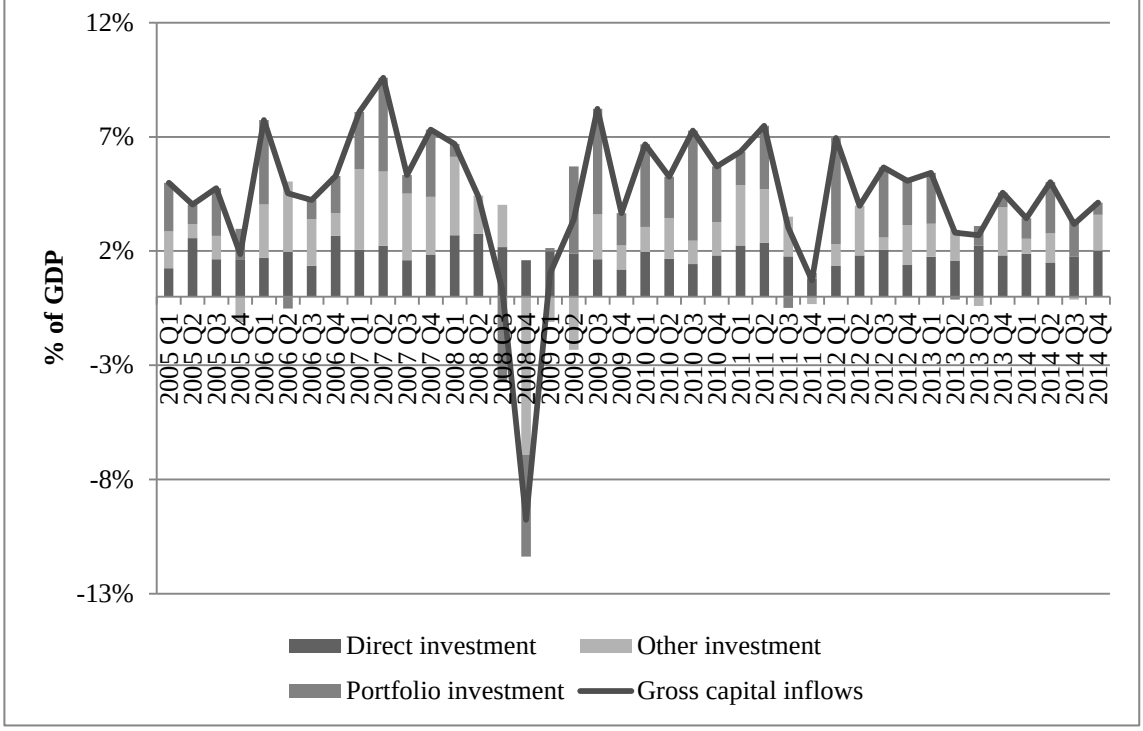
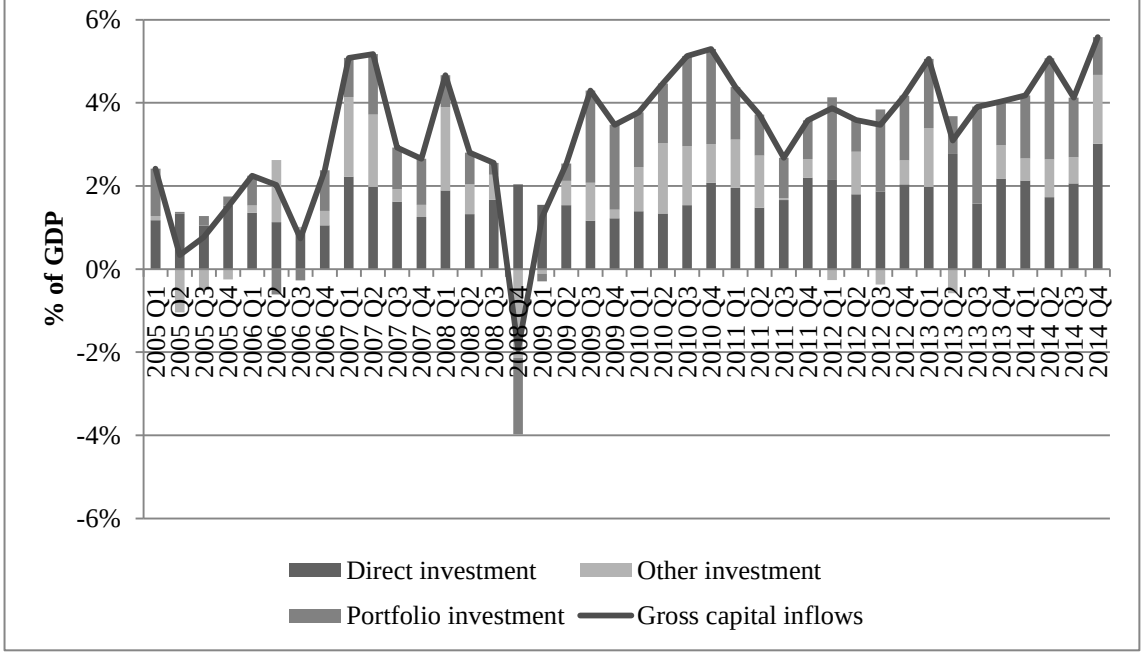


Figure A2 - Capital Inflows to Latin America



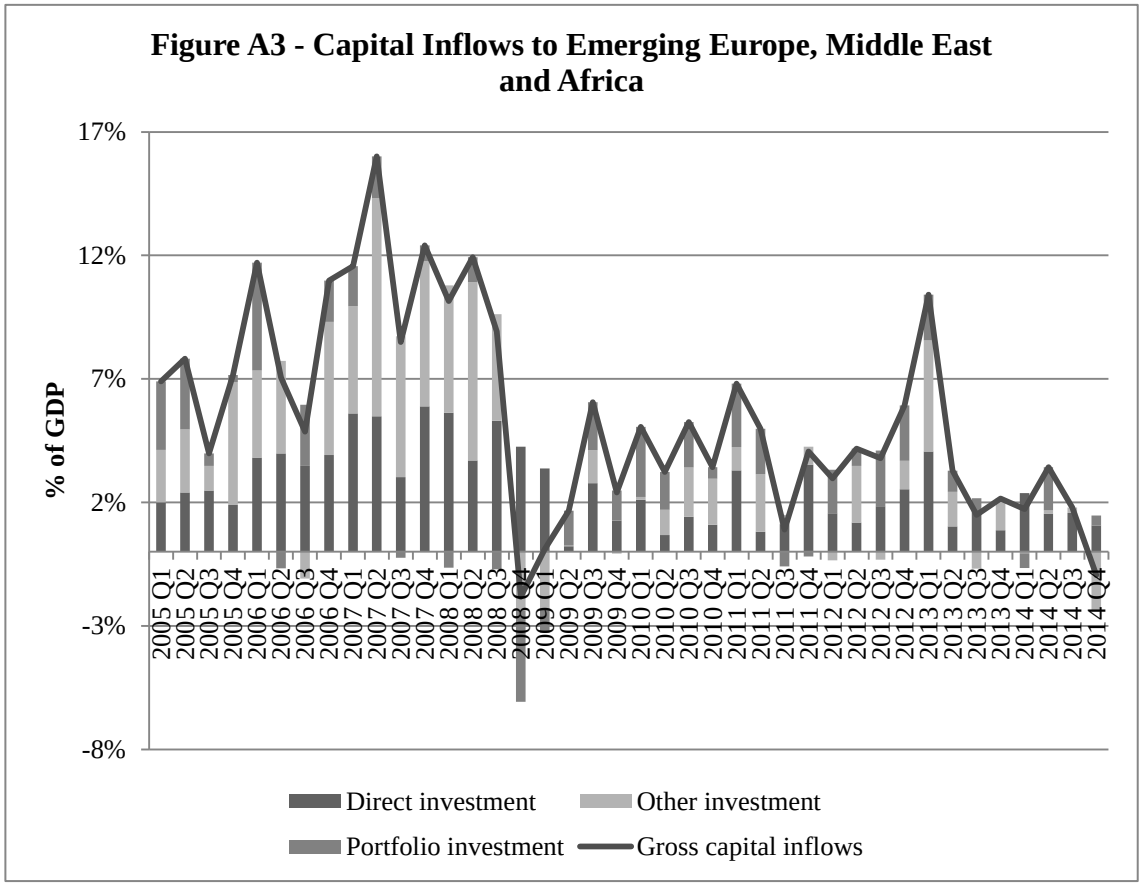
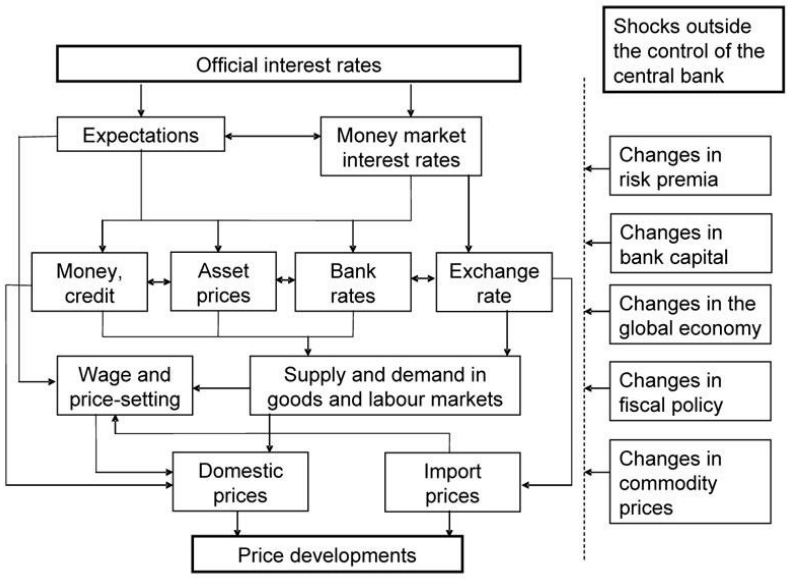


Figure A4



Source: ECB, https://www.ecb.europa.eu/mopo/intro/transmission/html/index.en.html

Tables

Table A1 – Summary description of the variables

Variable	*Description*	*Source*
Net capital inflows	Difference between gross capital inflows and gross capital outflows in percentage of nominal GDP.	Balance of Payments Statistics, 6th
Gross capital inflows	Changes on a country's stock of liabilities in a given period in percentage of nominal GDP.	Balance of Payments Statistics, 6th
L+	Absolute value of all increases in foreign liabilities from private domestic residents in the financial and capital accounts in percentage of nominal GDP.	Balance of Payments Statistics, 6th
L-	Absolute value of all decreases in foreign liabilities from private domestic residents in the financial and capital accounts in percentage of nominal GDP.	Balance of Payments Statistics, 6th
A+	Defined as the absolute value of all increases in foreign assets from private domestic residents in the financial and capital accounts in percentage of nominal GDP.	Balance of Payments Statistics, 6th
A-	Defined as the absolute value of all decreases in foreign assets from private domestic residents in the financial and capital accounts in percentage of nominal GDP.	Balance of Payments Statistics, 6th
GDP	Quarterly nominal gross domestic product in US Dollars.	IFS
Interest rate differential	Difference between a country's 3-month money market interest rate and an aggregate G4 interest rate, based on the 3-month money market of each of the four countries and weighted by the GDP	DataStream, IFS
Growth differential	Difference between a country's real growth over the homologous period and an aggregate G4 real growth, based on real growth of each of the four countries and weighted by the real GDP of those economies	IFS
VIX	VIX Implied volatility on options on the S&P 500 Index.	CBOE
Trade openness	Sum of imports and exports in percentage of nominal GDP.	IFS

Institutional quality	Average of six governance indicators that compose the World Governance Indicators	World Governance Indicators
Announcements	Dummy variable equals 1 if at least two or more central banks announced monetary policies with impacts on the balance sheet. Dummy equals 0 in the remaining cases.	BoE, BoJ, ECB, Federal Reserve
Balance sheet variation	Absolute or relative aggregate variation, in US dollars, of G4 central banks' balance sheet.	BoE, BoJ, ECB, Federal Reserve

Table A2 - List of Federal Reserve monetary actions' announcements with impact on the balance sheet

Date	*Program*	*URL*
25-11-2008	QE1	www.federalreserve.gov/newsevents/press/monetary/20081125b.htm
16-12-2008	QE1/extended language	www.federalreserve.gov/newsevents/press/monetary/20081216b.htm
28-01-2009	QE1	www.federalreserve.gov/newsevents/press/monetary/20090128a.htm
18-03-2009	QE1/extended language	www.federalreserve.gov/newsevents/press/monetary/20090318a.htm
12-08-2009	QE1	www.federalreserve.gov/newsevents/press/monetary/20090812a.htm
23-09-2009	QE1	www.federalreserve.gov/newsevents/press/monetary/20090923a.htm
04-11-2009	QE1	www.federalreserve.gov/newsevents/press/monetary/20091104a.htm
10-08-2010	QE2	www.federalreserve.gov/newsevents/press/monetary/20100810a.htm
21-09-2010	QE2	www.federalreserve.gov/newsevents/press/monetary/20100921a.htm
03-11-2010	QE2	www.federalreserve.gov/newsevents/press/monetary/20101103a.htm
22-06-2011	QE2	www.federalreserve.gov/newsevents/press/monetary/20110622a.htm
09-08-2011	Extended period language	www.federalreserve.gov/newsevents/press/monetary/20110809a.htm
21-09-2011	Maturity Extension Program	www.federalreserve.gov/newsevents/press/monetary/20110921a.htm
25-01-2012	Extended period language	www.federalreserve.gov/newsevents/press/monetary/20120125a.htm
20-06-2012	Maturity Extension Program	www.federalreserve.gov/newsevents/press/monetary/20120620a.htm
13-09-2012	QE3/extended period language	www.federalreserve.gov/newsevents/press/monetary/20120913a.htm
12-12-2012	QE3/extended period language	www.federalreserve.gov/newsevents/press/monetary/20121212a.htm
18-12-2013	Decrease of monthly asset acquisitions	www.federalreserve.gov/newsevents/press/monetary/20131218a.htm
29-01-2014	Decrease of	www.federalreserve.gov/newsevents/press/monetary/2

	monthly asset acquisitions	0140129a.htm
19-03-2014	Decrease of monthly asset acquisitions	www.federalreserve.gov/newsevents/press/monetary/20140319a.htm
30-04-2014	Decrease of monthly asset acquisitions	www.federalreserve.gov/newsevents/press/monetary/20140430a.htm
18-06-2014	Decrease of monthly asset acquisitions	www.federalreserve.gov/newsevents/press/monetary/20140618a.htm
30-07-2014	Decrease of monthly asset acquisitions	www.federalreserve.gov/newsevents/press/monetary/20140730a.htm
17-09-2014	Decrease of monthly asset acquisitions	www.federalreserve.gov/newsevents/press/monetary/20140917a.htm

Table A3 - List of ECB monetary actions' announcements with impact on the balance sheet

Date	*Program*	*URL*
28-03-2008	LTRO	www.ecb.eu/press/pr/date/2008/html/pr080328.en.html
15-10-2008	Fixed-rate tender, full allotment	www.ecb.eu/press/pr/date/2008/html/pr081015.en.html
07-05-2009	CBPP/LTRO	www.ecb.int/press/pressconf/2009/html/is090507.en.html
10-05-2010	SMP	www.ecb.eu/press/pr/date/2010/html/pr100510.en.html
30-06-2010	CBPP	www.ecb.eu/press/pr/date/2010/html/pr100630.en.html
06-10-2011	CBPP2	www.ecb.eu/press/pr/date/2011/html/pr111006_3.en.html
08-12-2011	LTRO	www.ecb.eu/press/pr/date/2011/html/pr111208_1.en.html
06-09-2012	OMT	www.ecb.eu/press/pr/date/2012/html/pr120906_1.en.html
02-05-2013	Fixed-rate full allotment MRO; 3- month LTRO	https://www.ecb.europa.eu/press/pressconf/2013/html/is130502.en.html
07-11-2013	Fixed-rate full allotment MRO; 3- month LTRO	https://www.ecb.europa.eu/press/pressconf/2013/html/is131107.en.html
05-06-2014	Targeted Longer-Term Refinancing Operations	https://www.ecb.europa.eu/press/pressconf/2014/html/is140605.en.html
04-09-2014	ABSPP & CBPP3	https://www.ecb.europa.eu/press/pressconf/2014/html/is140904.en.html

Table A4 - List of BoE monetary actions' announcements with impact on the balance sheet

Date	*Program*	*URL*
19-01-2009	APF	webarchive.nationalarchives.gov.uk/20100407010852/ www.hm-treasury.gov.uk/press_05_09.htm
05-03-2009	APF	www.bankofengland.co.uk/publications/Pages/news/2009/019.aspx
05-07-2009	APF	www.bankofengland.co.uk/publications/Pages/news/2009/037.aspx
08-06-2009	APF	www.bankofengland.co.uk/publications/Pages/news/2009/063.aspx
11-05-2009	APF	www.bankofengland.co.uk/publications/Pages/news/2009/081.aspx
02-04-2010	APF	www.hm-treasury.gov.uk/d/chx_letter_291111.pdf
06-10-2011	APF	www.bankofengland.co.uk/publications/Pages/news/2010/008.aspx
29-11-2011	APF	www.bankofengland.co.uk/publications/Pages/news/2011/092.aspx
09-02-2012	APF	www.bankofengland.co.uk/publications/Pages/news/2012/008.aspx
05-07-2012	APF	www.bankofengland.co.uk/publications/Pages/news/2012/066.aspx
13-07-2012	Funding Lending Scheme	http://www.bankofengland.co.uk/publications/Pages/news/2012/067.aspx
24-04-2013	Funding Lending Scheme	http://www.bankofengland.co.uk/publications/Pages/news/2013/061.aspx

Table A5 - List of BoJ monetary actions' announcements with impact on the balance sheet

Date	*Program*	*URL*
02-12-2008	SFSOs	www.boj.or.jp/en/announcements/release_2008/un0812b.pdf
19-12-2008	Outright JGB/CFI purchases	www.boj.or.jp/en/announcements/release_2008/k081219.pdf
22-01-2009	Outright CFI purchases	www.boj.or.jp/en/announcements/release_2009/mok0901a.pdf
19-02-2009	Outright CFI purchases	www.boj.or.jp/en/announcements/release_2009/mok0902b.pdf
18-03-2009	Outright JGB/CFI purchases	www.boj.or.jp/en/announcements/release_2009/k090318.pdf
15-07-2009	Outright CFI purchases/SFSOs	www.boj.or.jp/en/announcements/release_2009/k090715.pdf
30-10-2009	Outright CFI purchases/SFSOs	www.boj.or.jp/en/announcements/release_2009/k091030.pdf
01-12-2009	FROs	www.boj.or.jp/en/announcements/release_2009/k091201.pdf
17-03-2010	FROs	www.boj.or.jp/en/announcements/release_2010/k100317.pdf
21-05-2010	GSFF	www.boj.or.jp/en/announcements/release_2010/k100521.pdf
30-08-2010	FROs	www.boj.or.jp/en/announcements/release_2010/k100830.pdf
05-10-2010	APP	www.boj.or.jp/en/announcements/release_2010/k101005.pdf
14-03-2011	APP	www.boj.or.jp/en/announcements/release_2011/k110314a.pdf
14-06-2011	GSFF	www.boj.or.jp/en/announcements/release_2011/k110614a.pdf
04-08-2011	APP/FROs	www.boj.or.jp/en/announcements/release_2011/k110804a.pdf
27-10-2011	APP	www.boj.or.jp/en/announcements/release_2011/k111027a.pdf
14-02-2012	APP	www.boj.or.jp/en/announcements/release_2012/k120214a.pdf
13-03-2012	GSFF	www.boj.or.jp/en/announcements/release_2012/k120313a.pdf

27-04-2012	APP/FROs	www.boj.or.jp/en/announcements/release_2012/k120427a.pdf
12-07-2012	APP/FROs	www.boj.or.jp/en/announcements/release_2012/k120712a.pdf
19-09-2012	APP	www.boj.or.jp/en/announcements/release_2012/k120919a.pdf
30-10-2012	APP/SBLF	www.boj.or.jp/en/announcements/release_2012/k121030a.pdf
20-12-2012	APP	www.boj.or.jp/en/announcements/release_2012/k121220a.pdf
22-01-2013	APP	https://www.boj.or.jp/en/announcements/release_2013/k130122a.pdf
04-04-2013	Introduction of QQME	https://www.boj.or.jp/en/announcements/release_2013/k130404a.pdf
19-11-2014	APP	https://www.boj.or.jp/en/announcements/release_2014/k141119a.pdf

Table A6 – Sample

Non advanced economies	*Advanced Economies*
Argentina	Australia
Brazil	Austria
Bulgaria	Belgium
Chile	Canada
China	Denmark
Colombia	Finland
Croatia	France
Czech Republic	Germany
Ecuador	Greece
Egypt	Israel
Estonia	Italy
Hungary	Japan
India	Netherlands
Indonesia	New Zealand
Latvia	Norway
Lithuania	Spain
Malaysia	Sweden
Mexico	Switzerland
Morocco	United Kingdom
Peru	United States
Philippines	
Poland	
Romania	
Russia	
Servia	
Slovak Republic	
Slovenia	
South Africa	
South Korea	
Thailand	
Turkey	
Ukraine	

Table A7 – Pre and post-crisis regressions for all the economies' net inflows

Dependent variable:	*Net inflows*	*Net inflows*
Model:	*Fixed effects*	*Fixed effects*
Sample:	*All the economies*	*All the economies*
Period:	*2005Q1-2008Q3*	*2008Q4-2014Q4*
Equation:	*(A1)*	*(A2)*
VIX	0.0315	0.0162
	(0.0087)***	(0.0081)**
Growth differential	-0.0674	-0.1504
	(0.1508)	(0.1070)
Interest rate differential	-0.0188	-0.3828
	(0.0475)	(0.2851)
Trade openness	-0.0592	-0.0838
	(0.0443)	(0.0323)
Institutional quality	0.1188	0.1956
	(0.0547)**	(0.0507)***
Seasonally controlled	Yes	Yes
Observations	656	949
R-squared	0.62	0.289

Note: White robust standard errors in parenthesis. Dependent variable in % of GDP. * significant at 10%, ** significant at 5%, *** significant at 1%.

Table A8 – Pre and post-crisis regressions for all the economies' gross inflows

Dependent variable:	*Gross inflows*	*Gross inflows*
Model:	*Fixed effects*	*Fixed effects*
Sample:	*All the economies*	*All the economies*
Period:	*2005Q1-2008Q3*	*2008Q4-2014Q4*
Equation:	*(A3)*	*(A4)*
VIX	-0.0544	-0.0271
	(0.0261)**	(0.0205)
Growth differential	-0.2569	0.0561
	(0.4432)	(0.2502)
Interest rate differential	0.5318	-0.0434
	(0.3620)	(0.4957)
Trade openness	0.0528	0.0201
	(0.0948)	(0.0683)
Institutional quality	0.0276	0.2584
	(0.1207)	(0.1282)
Seasonally controlled	Yes	Yes
Observations	656	949
R-squared	0.382	0.125

Note: White robust standard errors in parenthesis. Dependent variable in % of GDP. * significant at 10%, ** significant at 5%, *** significant at 1%.

Table A9 – Net and gross inflows to non-advanced economies controlling for the Federal Reserve announcements

Dependent variable:	*Net inflows*	*Gross inflows*
Model:	*Fixed effects*	*Fixed effects*
Sample:	*Non-advanced economies*	*Non-advanced economies*
Period:	*2005Q1-2014Q4*	*2005Q1-2014Q4*
Equation:	*(A5)*	*(A6)*
VIX	-0.0221	-0.0491
	(0.0079)***	(0.0160)***
Growth differential	0.6166	0.8657
	(0.0875)***	(0.1297)***
Interest rate differential	-0.0002	0.5836
	(0.0689)	(0.3963)
Trade openness	-0.1588	-0.1861
	(0.0274)***	(0.0458)
Institutional quality	0.0743	0.1369
	(0.0303)***	(0.0488)***
UMP variables		
FED announcements	-0.0046	-0.0213
	(0.0045)	(0.0081)***
Seasonally controlled	Yes	Yes
Observations	867	871
R-squared	0.338	0.291

Note: White robust standard errors in parenthesis. Dependent variable in % of GDP. * significant at 10%, ** significant at 5%, *** significant at 1%.

Table A10 – Net and gross inflows to advanced economies controlling for the Federal Reserve announcements

Dependent variable:	*Net inflows*	*Gross inflows*
Model:	*Fixed effects*	*Fixed effects*
Sample:	*Advanced economies*	*Advanced economies*
Period:	*2005Q1-2014Q4*	*2005Q1-2014Q4*
Equation:	*(A7)*	*(A8)*
VIX	0.0293	-0.1343
	(0.0101)***	(0.0317)***
Growth differential	-0.0410	0.9631
	(0.1653)	(0.4625)**
Interest rate differential	0.6266	0.3035
	(0.2799)**	(0.8992)
Trade openness	-0.0348	-0.2698
	(0.0396)	(0.1655)
Institutional quality	0.1010	0.2620
	(0.0440)**	(0.1515)***
UMP variables		
FED announcements	0.0010	-0.0578
	(0.0067)	(0.0176)***
Seasonally controlled	Yes	Yes
Observations	719	719
R-squared	0.305	0.175

Note: White robust standard errors in parenthesis. Dependent variable in % of GDP. * significant at 10%, ** significant at 5%, *** significant at 1%.

Table A11 – Net and gross inflows to all the economies controlling for the Federal Reserve announcements

Dependent variable:	*Net inflows*	*Gross inflows*
Model:	*Fixed effects*	*Fixed effects*
Sample:	*All the economies*	*All the economies*
Period:	*2005Q1-2014Q4*	*2005Q1-2014Q4*
Equation:	*(A9)*	*(A10)*
VIX	0.0052	-0.0905
	(0.0062)	(0.0178)***
Growth differential	-0.0007	0.1014
	(0.0763)	(0.1824)
Interest rate differential	-0.0646	0.6074
	(0.0890)	(0.3325)*
Trade openness	-0.0939	-0.2054
	(0.0247)***	(0.0572)***
Institutional quality	0.1128	0.2474
	(0.0244)***	(0.0636)***
UMP variables		
FED announcements	-0.0050	-0.0488
	(0.0041)	(0.0097)***
Seasonally controlled	Yes	Yes
Observations	1605	1605
R-squared	0.299	0.161

Note: White robust standard errors in parenthesis. Dependent variable in % of GDP. * significant at 10%, ** significant at 5%, *** significant at 1%.

Table A12 – Benchmark results for the four-way elements regarding all the economies

Dependent variable:	*L+*	*L-*	*A-*
Model:	*Fixed effects*	*Fixed effects*	*Fixed effects*
Sample:	*All the economies*	*All the economies*	*All the economies*
Period:	*2005Q1-2014Q14*	*2005Q1-2014Q14*	*2005Q1-2014Q14*
Equation:	*(A11)*	*(A12)*	*(A13)*
VIX	-0.0371	0.0596	0.0641
	(0.0116)***	(0.0121)***	(0.0130)***
Growth differential	0.1089	-0.1131	-0.1122
	(0.0984)	(0.0867)	(0.0963)
Interest rate differential	0.4679	-0.1524	-0.1000
	(0.3199)	(0.0698)**	(0.0757)
Trade openness	-0.1003	0.0247	0.0386
	(0.0426)**	(0.0235)	(0.0237)
Institutional quality	0.0648	-0.1154	-0.1167
	(0.0508)	(0.0333)***	(0.0299)***
Seasonally controlled	Yes	Yes	Yes
Observations	1606	1606	1606
R-squared	0.382	0.26	0.244

Note: White robust standard errors in parenthesis. Dependent variable in % of GDP. * significant at 10%, ** significant at 5%, *** significant at 1%.

Table A13 – UMP results for the four-way elements regarding all the economies

Dependent variable:	*L+*	*L-*	*A-*
Model:	*Fixed effects*	*Fixed effects*	*Fixed effects*
Sample:	*All the economies*	*All the economies*	*All the economies*
Period:	*2005Q1-2014Q14*	*2005Q1-2014Q14*	*2005Q1-2014Q14*
Equation:	*(A14)*	*(A15)*	*(A16)*
VIX	-0.0072	0.0469	0.0534
	(0.0129)	(0.0112)***	(0.0118)***
Growth differential	0.0709	-0.0648	-0.0529
	(0.1010)	(0.0946)	(0.1029)
Interest rate differential	0.4661	-0.1700	-0.1410
	(0.3278)	(0.0826)*	(0.0872)
Trade openness	-0.0744	-0.0232	-0.0004
	(0.0459)	(0.0317)	(0.0305)
Institutional quality	0.1201	-0.1377	-0.1313
	(0.0634)*	(0.0436)***	(0.0386)***
UMP variable:			
G4 Central Banks	11.3806	-5.3644	-6.8285
Balance Sheet	(2.0262)***	(2.2300)**	(2.2664)***
Seasonally controlled	Yes	Yes	Yes
Observations	1400	1400	1400
R-squared	0.385	0.28	0.276

Note: White robust standard errors in parenthesis. Dependent variable in % of GDP. * significant at 10%, ** significant at 5%, *** significant at 1%.

Table A14 – Benchmark results for the four-way elements regarding the advanced economies

Dependent variable:	*L+*	*L-*	*A-*
Model:	*Fixed effects*	*Fixed effects*	*Fixed effects*
Sample:	*Advanced economies*	*Advanced economies*	*Advanced economies*
Period:	*2005Q1-2014Q14*	*2005Q1-2014Q14*	*2005Q1-2014Q14*
Equation:	*(A17)*	*(A18)*	*(A19)*
VIX	-0.0569	0.1016	0.1126
	(0.0189)***	(0.0244)***	(0.0281)***
Growth differential	0.7306	-0.4024	-0.4394
	(0.3474)**	(0.2803)	(0.2797)
Interest rate differential	-0.0106	-0.1501	-0.2893
	(0.5981)	(0.5386)	(0.5862)
Trade openness	-0.3185	-0.0355	-0.0306
	(0.1564)**	(0.0793)	(0.0705)
Institutional quality	0.0298	-0.2605	-0.1156
	(0.1234)	(0.0842)***	('0.0774)
Seasonally controlled	Yes	Yes	Yes
Observations	719	719	719
R-squared	0.307	0.252	0.246

Note: White robust standard errors in parenthesis. Dependent variable in % of GDP. * significant at 10%, ** significant at 5%, *** significant at 1%.

Table A15 – UMP results for the four-way elements regarding advanced economies

Dependent variable:	*L+*	*L-*	*A-*
Model:	*Fixed effects*	*Fixed effects*	*Fixed effects*
Sample:	*Advanced economies*	*Advanced economies*	*Advanced economies*
Period:	*2005Q1-2014Q14*	*2005Q1-2014Q14*	*2005Q1-2014Q14*
Equation:	*(A20)*	*(A21)*	*(A22)*
VIX	-0.0091	0.0696	0.0887
	(0.0225)	(0.0214)***	(0.0248)***
Growth differential	0.6093	-0.2269	-0.3235
	(0.3740)	(0.3090)	(0.3047)
Interest rate differential	-0.1316	0.0751	-0.0971
	(0.6346)	(0.6798)	(0.7222)
Trade openness	-0.3247	-0.1942	-0.1691
	(0.1613)**	(0.1199)	(0.1086)
Institutional quality	0.0128	-0.3143	-0.1364
	(0.1442)	(0.1072)***	(0.0987)
UMP variable:			
G4 Central Banks	17.0362	-11.3504	-11.1261
Balance Sheet	(3.9098)***	(4.6417)**	(4.6713)**
Seasonally controlled	Yes	Yes	Yes
Observations	619	619	619
R-squared	0.308	0.272	0.275

Note: White robust standard errors in parenthesis. Dependent variable in % of GDP. * significant at 10%, ** significant at 5%, *** significant at 1%.

Table A16 – Robustness check: relative expansion of G4 balance sheet regarding non-advanced economies' net and gross inflows

Dependent variable:	*Net inflows*	*Gross inflows*
Model:	*Fixed effects*	*Fixed effects*
Sample:	*Non-advanced economies*	*Non-advanced economies*
Period:	*2005Q1-2014Q4*	*2005Q1-2014Q4*
Equation:	*(A23)*	*(A24)*
VIX	-0.0190 (0.0085)**	-0.0190 (0.0085)**
Growth differential	0.5877 (0.0989)***	0.9056 (0.1495)***
Interest rate differential	-0.0211 (0.0762)	0.6659 (0.3964)*
Trade openness	-0.1806 (0.0309)***	-0.1858 (0.0549)***
Institutional quality	0.0638 (0.0323)**	0.2377 (0.0717)***
UMP variables		
Relative Expansion of G4 Central Banks Balance Sheet	0.2217 (0.0703)***	0.5261 (0.1323)***
Seasonally controlled	Yes	Yes
Observations	867	867
R-squared	0.295	0.265

Note: White robust standard errors in parenthesis. Dependent variable in % of GDP. * significant at 10%, ** significant at 5%, *** significant at 1%.

Table A17 – Robustness check: relative expansion of G4 balance sheet regarding non-advanced economies' four-way elements

Dependent variable:	*L+*	*L-*	*A-*
Model:	*Fixed effects*	*Fixed effects*	*Fixed effects*
Sample:	*Non-advanced economies*	*Non-advanced economies*	*Non-advanced economies*
Period:	*2005Q1-2014Q14*	*2005Q1-2014Q14*	*2005Q1-2014Q14*
Equation:	*(A25)*	*(A26)*	*(A27)*
VIX	-0.0041	0.0226	0.0217
	(0.0121)	('0.0063)***	(0.0067)***
Growth differential	0.2595	-0.0497	-0.2138
	(0.0863)***	(0.0535)	(0.0595)***
Interest rate differential	0.5718	-0.1012	-0.0794
	(0.3354)*	(0.0631)	(0.0887)
Trade openness	-0.0022	0.0040	0.0310
	(0.0314)	(0.0240)	(0.0264)
Institutional quality	0.1454	-0.0186	-0.0999
	(0.0541)***	(0.0186)	(0.0264)***
UMP variable:			
Relative Expansion of G4 Central Banks Balance Sheet	0.2991	-0.0151	-0.1364
	(0.0882)***	(0.0431)	(0.0516)***
Seasonally controlled	Yes	Yes	Yes
Observations	746	746	746
R-squared	0.409	0.23	0.347

Note: White robust standard errors in parenthesis. Dependent variable in % of GDP. * significant at 10%, ** significant at 5%, *** significant at 1%.

Table A18 – Robustness check: relative expansion of G4 balance sheet regarding advanced economies' net and gross inflows

Dependent variable:	*Net inflows*	*Gross inflows*
Model:	*Fixed effects*	*Fixed effects*
Sample:	*Advanced economies*	*Advanced economies*
Period:	*2005Q1-2014Q4*	*2005Q1-2014Q4*
Equation:	*(A28)*	*(A29)*
VIX	0.0325 (0.0109)***	-0.0717 (0.0341)**
Growth differential	-0.0041 (0.1828)	0.9438 (0.5048)*
Interest rate differential	0.3525 (0.3102)	-0.0579 (1.1119)
Trade openness	-0.0800 (0.0546)	-0.1144 (0.2248)
Institutional quality	0.1070 (0.0542)**	0.3362 (0.1805)*
UMP variables		
Relative Expansion of G4 Central Banks Balance Sheet	0.0433 (0.0861)	1.4304 (0.2813)***
Seasonally controlled	Yes	Yes
Observations	867	867
R-squared	0.276	0.166

Note: White robust standard errors in parenthesis. Dependent variable in % of GDP. * significant at 10%, ** significant at 5%, *** significant at 1%.

Table A19 – Robustness check: relative expansion of G4 balance sheet regarding advanced economies' four-way elements

Dependent variable:	*L+*	*L-*	*A-*
Model:	*Fixed effects*	*Fixed effects*	*Fixed effects*
Sample:	*Advanced economies*	*Advanced economies*	*Advanced economies*
Period:	*2005Q1-2014Q14*	*2005Q1-2014Q14*	*2005Q1-2014Q14*
Equation:	*(A30)*	*(A31)*	*(A32)*
VIX	-0.0070	0.0647	0.0856
	(0.0227)	(0.0212)***	(0.0246)***
Growth differential	0.7147	-0.2291	-0.3390
	(0.3836)*	(0.3184)	(0.3121)
Interest rate differential	-0.0474	0.0104	-0.1647
	(0.7005)	(0.7357)	(0.7838)
Trade openness	-0.3473	-0.2329	-0.1958
	(0.1681)**	(0.1251)*	(0.1137)*
Institutional quality	0.0239	-0.3123	-0.1322
	(0.1492)	(0.1146)***	(0.1052)
UMP variable:			
Relative Expansion of G4 Central Banks Balance Sheet	0.8756	-0.5548	-0.5407
	(0.1846)***	(0.2129)***	(0.2144)**
Seasonally controlled	Yes	Yes	Yes
Observations	783	783	783
R-squared	0.322	0.277	0.28

Note: White robust standard errors in parenthesis. Dependent variable in % of GDP. * significant at 10%, ** significant at 5%, *** significant at 1%.

Table A20 – Robustness check: benchmark results not controlling for seasonal effects regarding non-advanced economies' net and gross inflows

Dependent variable:	*Net inflows*	*Gross inflows*
Model:	*Fixed effects*	*Fixed effects*
Sample:	*Non-advanced economies*	*Non-advanced economies*
Period:	*2005Q1-2014Q4*	*2005Q1-2014Q4*
Equation:	*(A33)*	*(A34)*
VIX	-0.0258 (0.0077)***	-0.0601 (0.0160)***
Growth differential	0.6304 (0.0876)***	0.9167 (0.1267)***
Interest rate differential	0.0065 (0.0668)	0.5726 (0.3982)
Trade openness	-0.1585 (0.0272)***	-0.1914 (0.0459)***
Institutional quality	0.0735 (0.0304)**	0.1362 (0.0488)***
Seasonally controlled	No	No
Observations	867	867
R-squared	0.334	0.284

Note: White robust standard errors in parenthesis. Dependent variable in % of GDP. * significant at 10%, ** significant at 5%, *** significant at 1%.

Table A21 – Robustness check: benchmark results not controlling for seasonal effects regarding advanced economies' net and gross inflows

Dependent variable:	*Net inflows*	*Gross inflows*
Model:	*Fixed effects*	*Fixed effects*
Sample:	*Advanced economies*	*Advanced economies*
Period:	*2005Q1-2014Q4*	*2005Q1-2014Q4*
Equation:	*(A35)*	*(A36)*
VIX	0.0289 (0.0098)***	-0.1752 (0.0336)***
Growth differential	-0.0398 (0.1684)	1.1920 (0.4697)**
Interest rate differential	0.6420 (0.2776)**	0.3628 (0.9084)
Trade openness	-0.0349 (0.0399)	-0.2725 (0.1786)
Institutional quality	0.0996 (0.0428)**	0.2754 (0.1505)***
Seasonally controlled	No	No
Observations	867	867
R-squared	0.304	0.121

Note: White robust standard errors in parenthesis. Dependent variable in % of GDP. * significant at 10%, ** significant at 5%, *** significant at 1%.

Table A22 – Robustness check: UMP results without controlling for seasonal effects regarding non-advanced economies' net inflows

Dependent variable:	*Net inflows*	*Net inflows*
Model:	*Fixed effects*	*Fixed effects*
Sample:	*Non-advanced economies*	*Non-advanced economies*
Period:	*2005Q1-2014Q4*	*2005Q1-2014Q4*
Equation:	*(A37)*	*(A38)*
VIX	-0.0222 (0.0082)***	-0.0163 (0.0087)***
Growth differential	0.6202 (0.0958)***	0.5856 (0.0890)***
Interest rate differential	-0.0008 (0.0714)	0.0084 (0.0667)
Trade openness	-0.1806 (0.0302)***	-0.1555 (0.0269)***
Institutional quality	0.0647 (0.0316)**	0.0766 (0.0301)**
UMP variables:		
G4 Central Banks Balance Sheet	4.2601 (1.4783)***	
UMP Announcements		-0.0137 (0.0048)***
Seasonally controlled	No	No
Observations	764	867
R-squared	0.339	0.339

Note: White robust standard errors in parenthesis. Dependent variable in % of GDP. * significant at 10%, ** significant at 5%, *** significant at 1%.

Table A23 – Robustness check: UMP results without controlling for seasonal effects regarding non-advanced economies' gross inflows

Dependent variable:	*Gross inflows*	*Gross inflows*
Model:	*Fixed effects*	*Fixed effects*
Sample:	*Non-advanced economies*	*Non-advanced economies*
Period:	*2005Q1-2014Q4*	*2005Q1-2014Q4*
Equation:	*(A39)*	*(A40)*
VIX	-0.0490 (0.0174)***	-0.0365 (0.0173)***
Growth differential	0.8739 (0.1384)***	0.8059 (0.1328)***
Interest rate differential	0.6182 (0.4005)	0.5772 (0.3875)
Trade openness	-0.2096 (0.0518)***	-0.1839 (0.0456)***
Institutional quality	0.1911 (0.0616)***	0.1442 (0.0489)***
UMP variables:		
G4 Central Banks Balance Sheet	10.3220 (2.6632)***	
UMP Announcements		-0.0339 (0.0085)***
Seasonally controlled	No	No
Observations	764	867
R-squared	0.293	0.298

Note: White robust standard errors in parenthesis. Dependent variable in % of GDP. * significant at 10%, ** significant at 5%, *** significant at 1%.

Table A24 – Robustness check: UMP results not controlling for seasonal effects regarding advanced economies' net inflows

Dependent variable:	*Net inflows*	*Net inflows*
Model:	*Fixed effects*	*Fixed effects*
Sample:	*Advanced economies*	*Advanced economies*
Period:	*2005Q1-2014Q4*	*2005Q1-2014Q4*
Equation:	*(A41)*	*(A42)*
VIX	0.0313 (0.0106)***	0.0320 (0.0111)***
Growth differential	-0.0136 (0.1777)	-0.0583 (0.1693)
Interest rate differential	0.3264 (0.2897)	0.6362 (0.2791)**
Trade openness	-0.0722 (0.0537)	-0.0345 (0.0398)
Institutional quality	0.1050 (0.0516)**	0.0977 (0.0433)**
UMP variables:		
G4 Central Banks Balance Sheet	0.8241 (1.7949)	
UMP Announcements		-0.0041 (0.0062)
Seasonally controlled	No	No
Observations	619	719
R-squared	0.275	0.304

Note: White robust standard errors in parenthesis. Dependent variable in % of GDP. * significant at 10%, ** significant at 5%, *** significant at 1%.

Table A25 – Robustness check: UMP results not controlling for seasonal effects regarding advanced economies' gross inflows

Dependent variable:	*Gross inflows*	*Gross inflows*
Model:	*Fixed effects*	*Fixed effects*
Sample:	*Advanced economies*	*Advanced economies*
Period:	*2005Q1-2014Q4*	*2005Q1-2014Q4*
Equation:	*(A43)*	*(A44)*
VIX	-0.0904 (0.0351)**	-0.0963 (0.0357)***
Growth differential	0.8802 (0.5031)*	0.7084 (0.4670)
Interest rate differential	-0.0479 (0.9995)	0.2136 (0.8878)
Trade openness	-0.1248 (0.2225)	-0.2602 (0.1759)
Institutional quality	0.3018 (0.1740)*	0.2264 (0.1506)
UMP variables:		
G4 Central Banks Balance Sheet	25.5426 (6.0352)***	
UMP Announcements		-0.1080 (0.0186)***
Seasonally controlled	No	No
Observations	619	719
R-squared	0.119	0.151

Note: White robust standard errors in parenthesis. Dependent variable in % of GDP. * significant at 10%, ** significant at 5%, *** significant at 1%.

Table A26 – Robustness check: benchmark model applied to non-advanced economies' four-way elements not controlling for seasonal effects

Dependent variable:	*L+*	*L-*	*A-*
Model:	*Fixed effects*	*Fixed effects*	*Fixed effects*
Sample:	*Non-advanced economies*	*Non-advanced economies*	*Non-advanced economies*
Period:	*2005Q1-2014Q14*	*2005Q1-2014Q14*	*2005Q1-2014Q14*
Equation:	*(A45)*	*(A46)*	*(A47)*
VIX	-0.0146	0.0191	0.0226
	(0.0118)	(0.0035)***	(0.0043)***
Growth differential	0.2263	-0.0882	-0.2182
	(0.0656)***	(0.0369)**	(0.0433)***
Interest rate differential	0.5280	-0.0260	-0.0079
	(0.3558)	(0.0223)	(0.0413)
Trade openness	-0.0128	0.0068	0.0288
	(0.0276)	(0.0120)	(0.0172)*
Institutional quality	0.0588	-0.0007	-0.0547
	(0.0329)*	(0.0089)	(0.0148)***
Seasonally controlled	No	No	No
Observations	867	867	867
R-squared	0.408	0.235	0.295

Note: White robust standard errors in parenthesis. Dependent variable in % of GDP. * significant at 10%, ** significant at 5%, *** significant at 1%.

Table A27 – Robustness check: benchmark model applied to advanced economies' four-way elements not controlling for seasonal effects

Dependent variable:	*L+*	*L-*	*A-*
Model:	*Fixed effects*	*Fixed effects*	*Fixed effects*
Sample:	*Advanced economies*	*Advanced economies*	*Advanced economies*
Period:	*2005Q1-2014Q14*	*2005Q1-2014Q14*	*2005Q1-2014Q14*
Equation:	*(A48)*	*(A49)*	*(A50)*
VIX	-0.0674	0.1077	0.1180
	(0.0196)***	(0.0256)***	(0.0295)***
Growth differential	0.7621	-0.4298	-0.4641
	(0.3493)**	(0.2779)	(0.2819)
Interest rate differential	0.1569	-0.2059	-0.3345
	(0.6125)	(0.5372)	(0.5891)
Trade openness	-0.3238	-0.0513	-0.0460
	(0.1645)**	(0.0794)	(0.0710)
Institutional quality	0.0199	-0.2555	-0.1112
	(0.1268)	(0.0829)***	(0.0773)
Seasonally controlled	No	No	No
Observations	719	719	719
R-squared	0.272	0.229	0.225

Note: White robust standard errors in parenthesis. Dependent variable in % of GDP. * significant at 10%, ** significant at 5%, *** significant at 1%.

Table A28 – Robustness check: UMP results regarding non-advanced economies' four-way elements not controlling for seasonal effects

Dependent variable:	*L+*	*L-*	*A-*
Model:	*Fixed effects*	*Fixed effects*	*Fixed effects*
Sample:	*Non-advanced economies*	*Non-advanced economies*	*Non-advanced economies*
Period:	*2005Q1-2014Q14*	*2005Q1-2014Q14*	*2005Q1-2014Q14*
Equation:	*(A51)*	*(A52)*	*(A53)*
VIX	-0.0078	0.0182	0.0190
	(0.0126)	(0.0037)***	(0.0040)***
Growth differential	0.2017	-0.0838	-0.2040
	(0.0744)***	(0.0365)**	(0.0425)***
Interest rate differential	0.5658	-0.0339	-0.0295
	(0.3518)	(0.0244)	(0.0400)
Trade openness	-0.0171	0.0024	0.0250
	(0.0299)	(0.0140)	(0.0190)
Institutional quality	0.1323	0.0016	-0.0593
	(0.0469)***	(0.0104)	(0.0168)***
UMP variable:			
G4 Central Banks Balance Sheet	5.5006	-1.2026	-3.4935
	(1.7773)***	(0.6109)**	(0.8629)***
Seasonally controlled	No	No	No
Observations	771	771	771
R-squared	0.437	0.252	0.347

Note: White robust standard errors in parenthesis. Dependent variable in % of GDP. * significant at 10%, ** significant at 5%, *** significant at 1%.

Table A29 – Robustness check: UMP results regarding advanced economies' four-way elements not controlling for seasonal effects

Dependent variable:	*L+*	*L-*	*A-*
Model:	*Fixed effects*	*Fixed effects*	*Fixed effects*
Sample:	*Advanced economies*	*Advanced economies*	*Advanced economies*
Period:	*2005Q1-2014Q14*	*2005Q1-2014Q14*	*2005Q1-2014Q14*
Equation:	*(A54)*	*(A55)*	*(A56)*
VIX	-0.0158	0.0745	0.0928
	(0.0235)	(0.0221)***	(0.0259)***
Growth differential	0.6357	-0.2445	-0.3381
	(0.3771)*	(0.3081)	(0.3071)
Interest rate differential	0.0076	0.0555	-0.1030
	(0.6292)	(0.6733)	(0.7203)
Trade openness	-0.3319	-0.2071	-0.1828
	(0.1660)**	(0.1226)*	(0.1109)*
Institutional quality	-0.0031	-0.3049	-0.1287
	(0.1462)	(0.1056)***	(0.0979)
UMP variable:			
G4 Central Banks Balance Sheet	14.6128	-10.9299	-10.8928
	(3.8049)***	(4.7191)***	(4.7248)**
Seasonally controlled	No	No	No
Observations	619	619	619
R-squared	0.283	0.252	0.255

Note: White robust standard errors in parenthesis. Dependent variable in % of GDP. * significant at 10%, ** significant at 5%, *** significant at 1%.

Table A30 – Robustness check: estimation of the benchmark model regarding non-advanced using random effects

Dependent variable:	*Net inflows*	*Gross inflows*
Model:	*Random effects*	*Random effects*
Sample:	*Non-advanced economies*	*Non-advanced economies*
Period:	*2005Q1-2014Q4*	*2005Q1-2014Q4*
Equation:	*(A57)*	*(A58)*
VIX	-0.0211	-0.0548
	(0.0080)***	(0.0164)***
Growth differential	0.5785	0.9039
	(0.0876)***	(0.1345)***
Interest rate differential	-0.0215	0.4749
	(0.0771)	(0.3945)
Trade openness	-0.0846	-0.0274
	(0.0175)***	(0.0252)
Institutional quality	0.0573	0.0771
	(0.0129)***	(0.0148)***
Seasonally controlled	Yes	Yes
Observations	867	867
R-squared	0.127	0.12

Note: White robust standard errors in parenthesis. Dependent variable in % of GDP. * significant at 10%, ** significant at 5%, *** significant at 1%.

Table A31 – Robustness check: estimation of the benchmark model regarding advanced using random effects

Dependent variable:	*Net inflows*	*Gross inflows*
Model:	*Random effects*	*Random effects*
Sample:	*Advanced economies*	*Advanced economies*
Period:	*2005Q1-2014Q4*	*2005Q1-2014Q4*
Equation:	*(A59)*	*(A60)*
VIX	0.0260	-0.1557
	(0.0101)**	(0.0293)***
Growth differential	0.0077	0.9842
	(0.1580)	(0.4370)**
Interest rate differential	0.7225	-0.0226
	(0.2873)**	(0.7604)
Trade openness	-0.0459	0.0401
	(0.0225)**	(0.0489)
Institutional quality	-0.0181	0.0241
	(0.0182)	(0.0289)
Seasonally controlled	Yes	Yes
Observations	719	719
R-squared	0.055	0.118

Note: White robust standard errors in parenthesis. Dependent variable in % of GDP. * significant at 10%, ** significant at 5%, *** significant at 1%.

Table A32 – Robustness check: estimation of the UMP model regarding non-advanced economies' net inflows using random effects

Dependent variable:	*Net inflows*	*Net inflows*
Model:	*Random effects*	*Random effects*
Sample:	*Non-advanced economies*	*Non-advanced economies*
Period:	*2005Q1-2014Q4*	*2005Q1-2014Q4*
Equation:	*(A61)*	*(A62)*
VIX	-0.0141 (0.0086)	-0.0125 (0.0090)
Growth differential	0.5269 (0.0948)***	0.5276 (0.0884)***
Interest rate differential	-0.0250 (0.0852)	-0.0129 (0.0737)
Trade openness	-0.0827 (0.0172)***	-0.0820 (0.0172)***
Institutional quality	0.0526 (0.0134)***	0.0557 (0.0127)***
UMP variables:		
G4 Central Banks Balance Sheet	5.1682 (1.4951)***	
UMP Announcements		-0.0145 (0.0050)***
Seasonally controlled	Yes	Yes
Observations	764	867
R-squared	0.136	0.133

Note: White robust standard errors in parenthesis. Dependent variable in % of GDP. * significant at 10%, ** significant at 5%, *** significant at 1%.

Table A33 – Robustness check: estimation of the UMP model regarding non-advanced economies' gross inflows using random effects

Dependent variable:	*Gross inflows*	*Gross inflows*
Model:	*Random effects*	*Random effects*
Sample:	*Non-advanced economies*	*Non-advanced economies*
Period:	*2005Q1-2014Q4*	*2005Q1-2014Q4*
Equation:	*(A63)*	*(A64)*
VIX	-0.0344 (0.0166)**	-0.0277 (0.0168)
Growth differential	0.7268 (0.1368)***	0.7548 (0.1377)***
Interest rate differential	0.4820 (0.4252)	0.5064 (0.3719)
Trade openness	-0.0313 (0.0263)	-0.0303 (0.0251)
Institutional quality	0.0731 (0.0157)***	0.0768 (0.0149)***
UMP variables:		
G4 Central Banks Balance Sheet	11.7151 (2.7591)***	
UMP Announcements		-0.0465 (0.0101)***
Seasonally controlled	Yes	Yes
Observations	764	867
R-squared	0.133	0.143

Note: White robust standard errors in parenthesis. Dependent variable in % of GDP. * significant at 10%, ** significant at 5%, *** significant at 1%.

Table A34 – Robustness check: estimation of the UMP model regarding advanced economies' net inflows using random effects

Dependent variable:	*Net inflows*	*Net inflows*
Model:	*Random effects*	*Random effects*
Sample:	*Advanced economies*	*Advanced economies*
Period:	*2005Q1-2014Q4*	*2005Q1-2014Q4*
Equation:	*(A65)*	*(A66)*
VIX	0.0310 (0.0110)***	0.0304 (0.0112)***
Growth differential	0.0234 (0.1628)	-0.0188 (0.1613)
Interest rate differential	0.3488 (0.3039)	0.7151 (0.2876)**
Trade openness	-0.0496 (0.0245)**	-0.0457 (0.0230)**
Institutional quality	-0.0166 (0.0184)	-0.0172 (0.0188)
UMP variables:		
G4 Central Banks Balance Sheet	1.0073 (1.8572)	
UMP Announcements		-0.0063 (0.0067)
Seasonally controlled	Yes	Yes
Observations	619	719
R-squared	0.046	0.056

Note: White robust standard errors in parenthesis. Dependent variable in % of GDP. * significant at 10%, ** significant at 5%, *** significant at 1%.

Table A35 – Robustness check: estimation of the UMP model regarding advanced economies' gross inflows using random effects

Dependent variable:	*Gross inflows*	*Gross inflows*
Model:	*Random effects*	*Random effects*
Sample:	*Advanced economies*	*Advanced economies*
Period:	*2005Q1-2014Q4*	*2005Q1-2014Q4*
Equation:	*(A67)*	*(A68)*
VIX	-0.0770 (0.0302)**	-0.1016 (0.0340)***
Growth differential	0.5475 (0.4378)	0.6910 (0.4424)
Interest rate differential	0.1158 (0.7895)	-0.0143 (0.7653)
Trade openness	0.0257 (0.0443)	0.0417 (0.0480)
Institutional quality	0.0206 (0.0267)	0.0228 (0.0292)
UMP variables:		
G4 Central Banks Balance Sheet	29.8745 (6.1222)***	
UMP Announcements		-0.0794 (0.0208)
Seasonally controlled	Yes	Yes
Observations	619	719
R-squared	0.118	0.133

Note: White robust standard errors in parenthesis. Dependent variable in % of GDP. * significant at 10%, ** significant at 5%, *** significant at 1%.

Table A36 – Robustness check: estimation of non-advanced economies' four-way elements using random effects

Dependent variable:	*L+*	*L-*	*A-*
Model:	*Random effects*	*Random effects*	*Random effects*
Sample:	*Non-advanced economies*	*Non-advanced economies*	*Non-advanced economies*
Period:	*2005Q1-2014Q14*	*2005Q1-2014Q14*	*2005Q1-2014Q14*
Equation:	*(A69)*	*(A70)*	*(A71)*
VIX	-0.0124	0.0194	0.0232
	(0.0117)	(0.0035)***	(0.0047)***
Growth differential	0.2080	-0.0954	-0.2302
	(0.0628)***	(0.0362)***	(0.0433)***
Interest rate differential	0.4659	-0.0295	-0.0114
	(0.3662)	(0.0227)	(0.0333)
Trade openness	0.0311	0.0066	0.0249
	(0.0176)*	(0.0041)	(0.0074)***
Institutional quality	0.0431	0.0074	-0.0006
	(0.0150)***	(0.0029)**	(0.0038)
Seasonally controlled	No	No	No
Observations	719	719	719
R-squared	0.129	0.389	0.418

Note: White robust standard errors in parenthesis. Dependent variable in % of GDP. * significant at 10%, ** significant at 5%, *** significant at 1%.

Table A37 – Robustness check: estimation of advanced economies' four-way components using random effects

Dependent variable:	*L+*	*L-*	*A-*
Model:	*Random effects*	*Random effects*	*Random effects*
Sample:	*Advanced economies*	*Advanced economies*	*Advanced economies*
Period:	*2005Q1-2014Q14*	*2005Q1-2014Q14*	*2005Q1-2014Q14*
Equation:	*(A72)*	*(A73)*	*(A74)*
VIX	-0.0465	0.1090	0.1166
	(0.0181)**	(0.0254)***	(0.0285)***
Growth differential	0.6266	-0.6058	-0.4864
	(0.3616)*	(0.2880)**	(0.2694)*
Interest rate differential	-0.3482	-0.1703	-0.3209
	(0.6456)	(0.4408)	(0.5193)
Trade openness	0.0599	0.1271	0.0921
	(0.0638)	(0.0376)***	(0.0375)**
Institutional quality	0.0427	-0.0159	-0.0008
	(0.0465)	(0.0215)	(0.0228)
Seasonally controlled	Yes	Yes	Yes
Observations	719	719	719
R-squared	0.068	0.138	0.134

Note: White robust standard errors in parenthesis. Dependent variable in % of GDP. * significant at 10%, ** significant at 5%, *** significant at 1%.

Table A38 – Robustness check: estimation of the UMP model regarding the non-advanced economies' four-way elements using random effects

Dependent variable:	*L+*	*L-*	*A-*
Model:	*Random effects*	*Random effects*	*Random effects*
Sample:	*Non-advanced economies*	*Non-advanced economies*	*Non-advanced economies*
Period:	*2005Q1-2014Q14*	*2005Q1-2014Q14*	*2005Q1-2014Q14*
Equation:	*(A75)*	*(A76)*	*(A77)*
VIX	-0.0051	0.0184	0.0200
	(0.0118)	(0.0037)***	(0.0047)***
Growth differential	0.1848	-0.0960	-0.2236
	(0.0681)***	(0.0380)**	(0.0446)***
Interest rate differential	0.5220	-0.0312	-0.0255
	(0.3655)	(0.0239)	(0.0328)
Trade openness	0.0307	0.0072	0.0275
	(0.0184)*	(0.0044)	(0.0087)***
Institutional quality	0.0532	0.0083	-0.0004
	(0.0161)***	(0.0030)***	(0.0045)
UMP variable:			
G4 Central Banks Balance Sheet	6.0302	-0.9928	-3.0278
	(1.8359)***	(0.6387)	(0.7898)***
Seasonally controlled	Yes	Yes	Yes
Observations	766	745	747
R-squared	0.113	0.159	0.199

Note: White robust standard errors in parenthesis. Dependent variable in % of GDP. * significant at 10%, ** significant at 5%, *** significant at 1%.

Table A39 – Robustness check: estimation of the UMP model regarding the advanced economies' four-way elements using random effects

Dependent variable:	*L+*	*L-*	*A-*
Model:	*Random effects*	*Random effects*	*Random effects*
Sample:	*Advanced economies*	*Advanced economies*	*Advanced economies*
Period:	*2005Q1-2014Q14*	*2005Q1-2014Q14*	*2005Q1-2014Q14*
Equation:	*(A78)*	*(A79)*	*(A80)*
VIX	0.0159	0.0945	0.1070
	(0.0199)	(0.0243)***	(0.0267)***
Growth differential	0.4085	-0.5109	-0.4202
	(0.3772)	(0.3074)*	(0.2911)
Interest rate differential	-0.4941	-0.2599	-0.4259
	(0.7043)	(0.5282)	(0.6214)
Trade openness	0.0935	0.1323	0.0967
	(0.0659)	(0.0435)***	(0.0431)**
Institutional quality	0.0289	-0.0189	-0.0018
	(0.0476)	(0.0244)	(0.0257)
UMP variable:			
G4 Central Banks Balance Sheet	18.7745	-10.1148	-10.2462
	(4.0871)***	(4.5716)**	(4.6345)**
Seasonally controlled	Yes	Yes	Yes
Observations	619	619	619
R-squared	0.073	0.133	0.140

Note: White robust standard errors in parenthesis. Dependent variable in % of GDP. * significant at 10%, ** significant at 5%, *** significant at 1%.